ENGINEERING AND MINING JOURNAL

DECEMBER, 1946

Prospecting with Geiger-Mueller counter for uranium ore at Great Bear Lake

Siam Offers New Mining Opportunities—Page 60

ENGINEERED
Hydroseal Pumping Systems
NOT JUST "PUMPS FOR SALE"

This operator now knows something about Hydroseal Pump performance, which would have seemed almost unbelievable before the installation was made. Their C-Frame Hydroseal handled 123,550,000 gallons of tailings from their Bowl Classifier through 4000 feet of 8" pipeline between May 15 and Oct. 31, 1945. This represented 99,701 tons of minus 1/4" material having a dry gravity of 3.0, the sp. gr. of the solution being 1.15.... During this period, no delay of operations or repairs were chargeable to the Hydroseal (see operator's letter) and at the end of the season, inspection of the pump showed it was ready for this season (1946).... If you have an unusual or difficult materials pumping job, call on the Hydroseal Engineer. He can do more than "sell pumps", if you need more. Catalog on request.

One operator on the Mesabi Iron Range wr

With reference to your letter of January 2

relative to the Hydroseal pump performance a

our iron ore washing plant.

Enclosed is a profile of the 8" tailings dis-

charge line.

This frame "C" pump is driven by one 25 H.P.

motor, "V" belt connected to the pump shaft. The

power input to the motor is 18 H.P. There have

been no delays or repairs chargeable to this

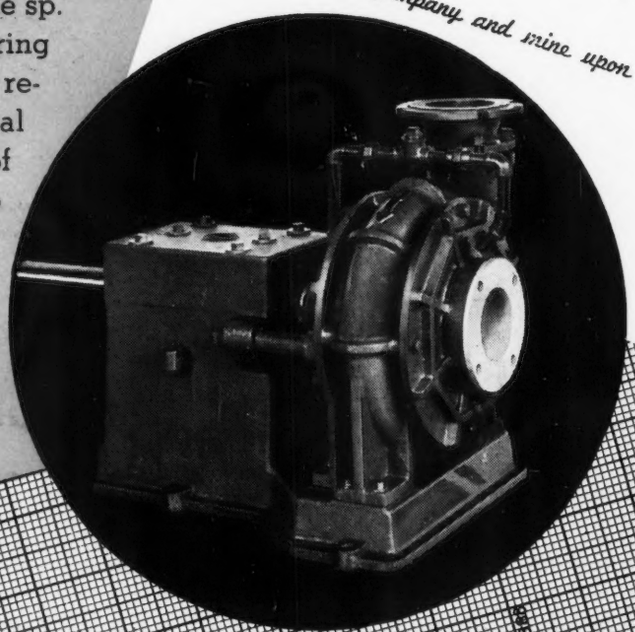
installation.

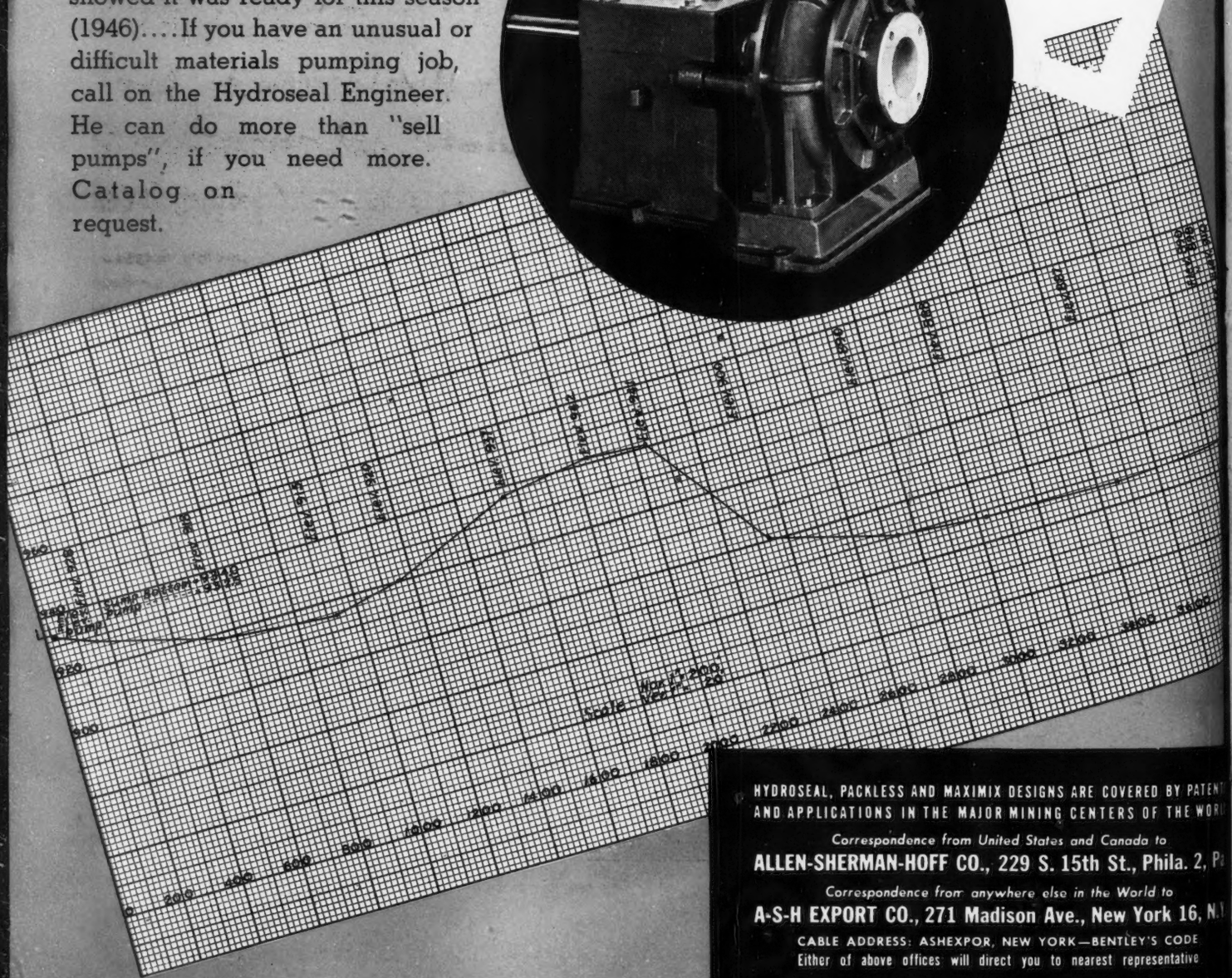
The pump operated 2288 hours, handling

123,552,000 gallons of which 99,701 tons were

tailings or solids

Name of Company and mine upon request.





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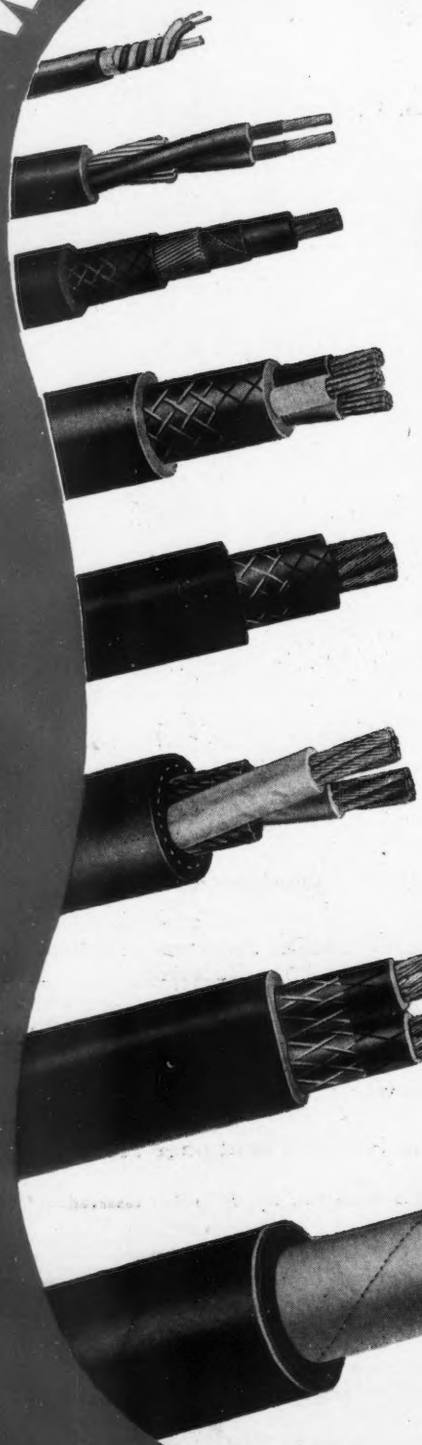

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ENGINEERING AND MINING JOURNAL

DECEMBER, 1946

Press Your Tariff Viewpoint Vigorously

PRODUCERS who have an interest in the commodities listed for possible tariff cuts will do well to exert themselves vigorously in guarding against official ignorance during the forthcoming negotiations (p. 85).

Probably the existence of a Republican Congress will do much to make the State Department more cautious in its promulgation of tariff cuts, but considering the treatment given domestic mineral producers in prior Reciprocal Trade bargaining, interested parties should not depend so much on this factor that they neglect all possible efforts to see that both Congress and the Executive Branch are informed of their viewpoint. In these past proceedings the State Department has pontificated about careful, expert attention and meticulous study, and then proceeded to display a schoolboy level of knowledge on specific problems. Over the signatures of its highest officers it has promised that it would not injure "established domestic industries," and has then proceeded to act in a contrary direction. It has dwelt at great length on the reciprocal nature of its bargaining, but glossed over the fact that its policy of generalizing concessions to all countries, despite the circumstance that ours is the world's largest market, makes it impossible to achieve gains equal to what we concede. Also, the Department has repeatedly stated that its policy is to make concessions only in treaties with the largest source of imports of a given commodity, but in the mineral field alone the concessions on manganese to Brazil, on cobalt oxide and zinc to Canada, and on zinc oxide to Mexico violated this covenant.

Thus, we again urge interested producers to exert themselves with the fullest possible vigor to make their viewpoints understood, regardless of any reassurances which may be forthcoming.

St. Joe Strike Is Cause for Concern

THE RECENT STRIKE at the St. Joseph Lead Co. mines in Southeast Missouri (E.&M.J., Nov., p.86) should give every mine operator in the country food for thought. If this costly, unnecessary stoppage could occur there, few places are immune from similar stoppages. Also, if 3,400 men will give up their jobs over a routine incident, the affair indicates an appalling lack of respect for law and jobs, of public responsibility, and of family interest.

The dispute occurred over the discharge of an underground employee for gross insubordination and refusal to comply with the reasonable request of a supervisor. After the incident occurred, it was considered by the grievance committee, which concluded that the employee merited discharge and that failure to discharge him would have a disruptive effect on discipline. Then, when the union leadership was dissatisfied, the company offered to arbitrate. However, arbitration was spurned, and 3,600 men struck, shutting down all the company's mines in the district and the smelter at Herculaneum. In short, one-third of the country's seriously short primary lead supply was shut down over the discharge of a single insubordinate worker, whose dismissal was sanctioned by the local grievance committee. By the time the men went back to work ten days later, they had sacrificed $220,000 of their own earnings, had made a substantial contribution to public inconvenience and to unemployment in manufacturing, and had gained nothing that they could not have gained by accepting the company's first offer to arbitrate. After the strike began, a Government arbitrator, after acknowledging that the employee had been unreasonably and profanely insubordinate, directed his reinstatement without interim pay.

This stoppage was remarkable not only because of its insufficient basis, but in view of the rural environment and the company's long record of good labor relations. We are often inclined to relate labor troubles to the rootless life of metropolitan areas, to alien ideas of foreign-born workers, or to Communist infiltration. However, in this case most of the workmen have lived all their lives in the pleasant Ozark hills, own their homes, and

are of families whose Americanism dates back to Colonial times. If there are Communists among them, the percentage is exceedingly small. For many years this company has had a progressive interest in the welfare of employees, has contributed to local education and recreation, assisted employees in the purchase of homes, and installed loan and retirement plans. It has adhered to the creed that when a workman served the company well, his future was secure. This policy was so sincerely applied that the company had not had a strike in 30 years, and was unionized at all only because the New Deal Administration refused to permit the payment of parity wages during the war, except at the request of a union! Since being thus ushered into the picture, the union leadership has persistently dedicated itself to disharmony between the company and its employees.

When, even under such enviable working and living conditions, workmen show such startling willingness to go along with irresponsible, destructive leadership, we can only conclude that all the mining employers of the country have a tremendous educational task ahead of them before industrial stability can be secured.

We do not think there is any simple answer to this problem. Every situation has its own local complications. However, we believe it will be helpful to study the views of Whiting Williams, published herewith.

Praise for Canadian Cooperation

ANOTHER INSTANCE of the progressive attitude of Canadian mining and of the excellent relationship between it and Government was reported in our November news columns (p.114-15). We are referring to a meeting in late September at Winnipeg of leading Canadian mining men, Dominion Government technical men, and provincial representatives for the purpose of formulating industry-government policies. This group, initiated two years ago, is known as the Interprovincial Committee on the Mining Industry.

At this meeting, subcommittees concerned with a variety of mining problems reported to a Ministers' Committee, composed of the provincial ministers of mines. The ministers in turn recommended that: (1) a commission should be appointed to survey the whole field of mineral taxation; (2) a national coal policy should be formulated; (3) mineral conservation is of prime importance and each province should have a committee to develop conservation policies; (4) various research activities should be coordinated; (5) more liberal grants for research should be encouraged; (6) the Dominion Government should undertake aerial and topographic mapping and should have unexplored areas mapped within 10 years.

What we particularly admire about these proceedings, and recommend for American attention, is the harmonious, constructive relationship between industry and Government. This is the atmosphere for progress! Only when each understands the other's problems and takes account of them can sound policies be achieved.

Montana Modernizes Mineral Education

COMPLACENCY is such a common characteristic that it is refreshing indeed to witness the desire "to see ourselves as others see us" evinced by recent action of the Montana School of Mines. At the request of the school's enterprising president, Dr. Francis A. Thompson, a 27-man committee of alumni, students, and faculty made an objective, exhaustive inquiry into ways and means of improving the school's educational practices.

The general recommendations seem to us entirely applicable to most undergraduate engineering curricula throughout the country. In brief, they urged emphasis on basic science rather than details of application or specialization, inspirational teaching by a well-qualified staff, and vocational guidance. They recommended more attention to public speaking, sociology, civics, economics, cultural subjects, and English, particularly the latter, in order to "insure the objective of the college, the graduation of technically trained gentlemen." We heartily indorse these views. Similar changes are being instituted at the Michigan and Missouri mining schools (E.&M.J., Jan., p. 102, and Oct., p. 106).

The mining industry has a vital stake in the quality of mining school graduates, as most of its future executives as well as engineers will undoubtedly be technical men. Therefore, mining men are simply serving their companies intelligently when they take an interest in mining schools. They can help in many ways, by counseling with students and faculties, by offering jobs to students and graduates, and by setting up scholarships and research programs. The financial help is important, and the inspirational effect of their interest is fully as valuable. Both are needed.

Selling Mining to the Miner

"The psychological conditions of a man's job are much more important than its physical conditions. When an employer fails to understand the mental attitude of his workers toward their work, he delivers them into the hands of the labor leader who does understand their mental attitude, and who then uses his understanding to create warfare between them and their employer."

WHITING WILLIAMS
Cleveland, Ohio

WITHOUT QUESTION, our employers have done a much poorer job of selling mining to the miners than have their leaders!

Why? What is the reason for this?

Well, I recall asking a famous sales manager what was the formula by which he had so greatly increased his outfit's sales that he was famous throughout the selling world? "That's very simple," he replied. "I am simply applying to the selling of insurance the idea my old professor gave me when I asked him for the secret that made him the best of all my teachers. 'You must have in mind,' he told me, 'that nobody ever taught arithmetic—*except* as he taught arithmetic *to* John or Jim or Joe or Jennie. So, if you want to teach arithmetic, you must know not only all you can about arithmetic, but also know all you can about John and Jim and Joe and Jennie.'"

Today too many employers follow only the first of two basic rules of salesmanship. The first rule is that you must study and know and respect your job—your mining know-how. The second rule is that you must know and study and respect your customer, in this case your employee.

It has been my business for the last 27 years to study this customer, this employee, by working and living alongside him, often sleeping with him, two in a bed and six in a room, in mines and steel plants in the United States, Great Britain, Germany, France, and Russia. I have taken much time and pains finding out what makes these fellow workers of ours, on every level, tick. I have spent hours trying to learn what's on the minds of Joe the bum, Jim the booze-hound, and all sorts of self-respecting workers in mines, steel plants, roundhouses, and whatnot. As a result, I have become convinced that every one of them was filled with the desire to consider himself important in some way, to figure out that, after all, he had a right to enjoy his self-respect, to feel justified and significant as a human being in comparison with other human beings.

This sounds easy, but I have never yet found one single person who was as sure of himself and his right to enjoy his self-respect, *as he would like to be.* It is my observation that, drunk or sober, young or old, male or female, sane or insane, every one of us from top to bottom is everlastingly trying to avoid having to confess himself a person of no importance.

His Job the Certificate

But the most important of my findings was this: Every one of these, whether drunk or sober, whether important or unimportant, was always using as the absolute proof of his right to his self-respect exactly the same certificate. That proof, that certificate, was always one thing—his job, his daily job! When it comes to building a man's self-respect, his right to consider himself an important individual in the scheme of things, there is nothing that can compare with his job.

It is absolutely impossible to overstate the importance of our jobs as giving final proof that we can hold up our heads along with other people. Engineers in locomotive cabs have often told me how important they are to the railroad. In the same way a fireman said to me one day: "See that engineer across the cab? You'd think he was runnin' the whole damn railroad. But, take it from me, he wouldn't get his engine very far down the road unless he got his *power* from *me!* Throughout the entire world, everywhere there is that same dependence upon our jobs. I have often told about the hobo whom I insulted by calling him a tramp! The tramp of course considers himself much more important than a mere bum. All of us are mindful of our social status. And here in America, our social status is determined by our job.

My greatest surprise was when I learned, quite contrary to the public's understanding, that nowhere is there such pride of craft, such a feeling of job importance, as is encountered in any mine. Recently I visited a coal mine in Kentucky, and there I saw exactly that same feeling of job mastery, the feeling of independence that comes from handling tools with the sureness of long experience.

I have been told that this sense of personal job mastery, independence and responsibility, characterizes the metal miner even more than it does the coal miner. At any rate, I have heard more talk and seen more demonstration of job pride in terms of individual craftsmanship, in an ordinary mine in an average day, than I have among ordinary factory workers in a month!

Every miner takes great pride in being a member of a basic industry.

Now, add to these characteristics

* Presented at the 1946 Metal Mining Convention and Exposition, Western Division, The American Mining Congress, Denver, Colo., Sept. 9-12, 1946.

the fact that in many cases your miner has come from years of independent life and work as a farmer. Then add to that the further fact that your Johns, Joes, and Jims have often grown up in communities too remote to furnish a first-class education or to instill the desire for a high level of living. All this I submit explains both the prevailing absenteeism and the difficulty of lessening it by persuasion.

To all this, add the further important fact that the mining industry has long suffered from notable irregularity of operation. My studies of industrial conditions convince me that irregular work tends to make an irregular worker. And an irregular worker is bound to be an irregular citizen—temperamental, hard to get along with. Certainly there is nothing more demoralizing than inability to know at noon today whether you work or not tomorrow!

The physchological conditions of a man's job are much more important than its physical conditions. When an employer fails to understand the mental attitude of his workers toward their work, he delivers them into the hands of the labor leader who does understand their mental attitude, and who then uses his understanding to create warfare between them and their employer.

So it is very natural that supersalesman John L. Lewis joins other supersalesmen such as Reid Robinson in utilizing their followers' pride of craftsmanship and of miner calling for opposing those employers who fail to understand their miners' feelings, and especially fail to understand the ease with which those feelings can be hurt by some boss who shows little or no concern for his workers' daily troubles and no recognition whatever for their daily accomplishments.

It is also easy to understand why such a leader as John Lewis appeals constantly to that pride of calling which marks the coal miner. Not once but a dozen times have I been assured that—"We coal miners are the shock troops of the Army of Labor! When we sacrifice ourselves to obtain some advanced position we benefit all other workers. Before long, thanks to us, they'll occupy the ground we were the first to win!"

That is good human psychology—above all good *miner* psychology and leadership! It indicates that John Lewis knows his Joes, Jims, and Johns!

I recommend the use of three different tools to be used if mining is to be sold to the miner by employers who understand the mental set-up which he brings to his job. They are recommended for building and increasing the miner's pride of craft and calling.

WHITING WILLIAMS

"Today we are also thinking too much of merely winning victories over the union. You can win victories with the help of your lawyers by going to court. But you can't win friends among your workers by any other means than by close, understanding, personal contact."

The first tool is to make vastly more use than is now being made of explanation, information, two-way communication. Beyond imagination was the ignorance I found in a certain mining town which I lately visited, twenty-five years after I had worked there as a laborer. The local leaders were especially, almost inconceivably, ignorant of the purposes of their employers and of their industry as a whole. Employers have an enormous opportunity to improve their labor relations by dispelling this ignorance.

If I were to put a small plaque on the desk of every executive as a reminder of the one rule I would like him to follow every day, it would read, "Explain, explain, explain. If you can't explain, explain *why* you can't explain."

It should also be easy for employers to do a better job of facilitating mining education. Statistics of the mining industry show a disquietingly small percentage of educated people in comparison with other industries. However, I visited a coal mine not long ago where the only college-bred man was the superintendent. Nevertheless, the electrical, engineering, and all other departments were ably directed by men who had been helped by management to take night studies or correspondence courses.

The second tool would be called commendation, the use of the pat on the back for work well done. I don't mean handing out bouquets promiscuously. The surest way to lose the respect of a craftsman is to pay him a compliment for what he knows is a lousy job. But today we are not making anything like the proper use of commendation *when deserved.*

Incidentally, I am hoping, even though it appears difficult to work out incentives in highly mechanized mines, that, nevertheless, some plan of recognition for good production can be utilized. Not long ago I asked a vice president of a Cleveland mining company how come he won his reputation for getting increased production. "Williams," he said, "I hate to tell you. It sounds so silly. Of course, I try to improve organization and methods, but the thing I count on most is this—that after I've been on the job a short while, every miner knows that, if he sends up an exceptional day's tonnage, I will, without fail, meet him at the change-house door with a cigar and a word of thanks!"

For many long years we used to depend on the prod of fear. I have heard many foremen say, "After all, you've got to depend upon the fear of God to get work out of these fellows." They didn't mean the fear of God but the fear of foremen, and they didn't mean the fear of foremen so much as the fear of discharge, the fear of the misery of the man who has lost his job, his certificate to self-respect and status. Now that this prod of fear cannot be used as it used to be, I recommend the pat on the back, when deserved, as an effective substitute.

The third tool is this—close personal contact with your individual miner. I am a crank on contact ever since, a number of years ago, I worked in Germany's Saar Valley mines just after their operation had been given over to France and French engineers. To my amazement, I found the German coal miners delighted with their new bosses. When I asked these engineers about it, they explained: "You see, 80 percent of the coal here in Europe depends upon the proper handling of the most sensitive, most complex,

most delicate, machine in the world —namely, the miner. We are convinced, therefore, that we must not give over to any foreman or other intermediary the full responsibility for the care and nurture of that machine, the miner. We are taught, therefore, in our engineering schools, to spend two hours of every working day talking face to face with the miners in this part of the mine today and that part of the mine tomorrow."

So, when I would be working there, the superintendent, one of the most distinguished engineers of France, would come along accompanied by his assistant. "Good morning, gentlemen," they'd say, "how are you doing today? Are we giving you good ventilation? Are the pumps working all right?" When my German buddies would proceed to complain about the high cost of living they would take time to explain how things could be helped by more tonnage. When, an hour later, they left, my buddies would exclaim: "What do you think of that? From the kindergarten up we have been taught in the schools of Germany to hate every Frenchman. Yet, we are treated better by these French than by our bosses from Prussia!"

I think it must be said that our American engineering schools were long deficient in this regard. In a certain Western state, students told me they had made a request of the dean of the engineering school for a course on human relations and psychology. The dean had refused. So the boys had organized on their own initiative a club for discussing the psychological angles of the engineer's job. There in the Saar I saw books on the desks of the French engineers about how to get along, for instance, with the Poles as compared with the Scandinavians—books which the ordinary American engineer would almost fear to be caught dead with!

All this means that we must perceive that our jobs, the jobs of all of us, do vastly more than merely put money in our pockets or bread in our stomachs. In addition, they put something at the bottom of our hearts without which we cannot feel worth while as a human being. This means also that our feelings can be hurt more easily there on our jobs than in any other part of our living. And this is truer of the miner, for the reasons I have mentioned, than of any other worker I know. No employer can hope to do a good job of selling his jobs to his workers unless he understands how easily their feelings can be hurt by some very little thing.

"I say to you, men do not follow the line of least resistance. Instead, they follow the line of maximum right to think well of themselves per unit of effort expended."

This is worth mentioning because the labor leaders have got us all to thinking that the labor problem is full of big issues, historic gaps which inevitably separate employer from employee. But all the time, this leader is signing up members by facing the employer for the adjustment of some little thing on the employee's behalf.

By personal contact with the employee you can learn what those little pin-pricks are and fix them before they fester into big troubles. Otherwise all the leader needs to do is to demonstrate the guts required to demand some minor improvement and he signs up members. And if these minor matters have failed for years to get management's attention, no member will care a hoot whether the leader is a Baptist or a "Bolshy." This matter of contact is worth mentioning today for another reason. Today, too many employers take the labor leader vastly more seriously than he should be taken, at the same time that they take their rank-and-file employees vastly *less* seriously than they deserve to be taken. These employers assume that the ordinary union member always does what the leader tells him. You get closer to the heart of the matter if you realize what every leader knows: that he remains a leader only so long as he follows the wishes and the pressures of his members. If, therefore, you want to lessen the pressures he constantly puts upon you, you must try to lessen the pressures put upon him, by getting closer to those little pressures where they originate.

Close Contact Vital

Today we are also thinking too much of merely winning victories over the union. You can win victories with the help of your lawyers by going to court. But you can't win friends among your workers by any other means than by establishing close, understanding, personal contact.

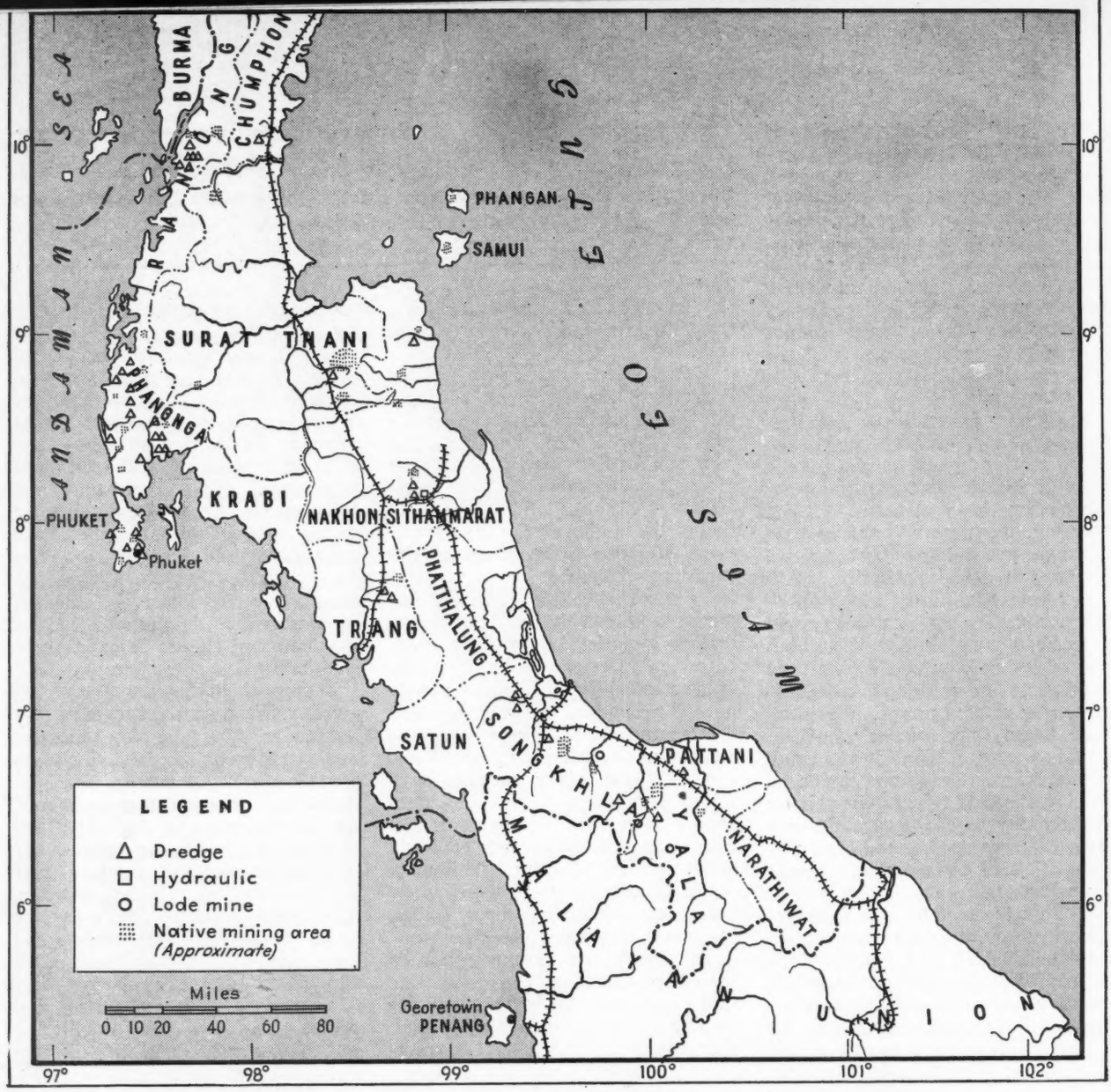
This close contact is particularly important when *crisis* comes to the worker, when times are bad, and particularly when there is a scarcity of jobs.

One reason why the CIO has made its surprising growth is that it showed the Johns, Joes, and Jims, in mine, mill, and factory, deeper concern about the miseries they were going through than did their employers. Make sure that you show concern and understanding by means of your close contact with your miner in his worst times. Then you will find that we all tend to change for the better the moment we master a crisis and also that we consider our closest friends those who help us master our crises.

Today we suffer from a tragic paradox. We are taught by our political leaders that it is silly to expect our workers to see in their work anything but the money, or to do more work except for more money. At the same time, the sons and fathers of these same supposedly hard-boiled workers, fighting over there in Iwo Jima, France, and Germany, were walking gladly to face death itself. Why? Because we paid them money? No, they faced death gladly because, as they walked, they felt certain of your recognition and my recognition of their nobility. I say to you, men do not follow the line of least resistance. Instead, they follow the line of maximum right to think well of themselves per unit of effort expended.

We have no respect for the boss who asks too little of us. We dislike the boss who makes it difficult for us to think better of ourselves as the result of following his orders. We hate the very guts of the boss who hogs all the credit for the job and gives us no recognition whatever for our part in it except our pay-check. At the same time we go through hell gladly for the man who asks of us our utmost and then enables us to think better of ourselves in full proportion.

So, I give you those three tools of Explanation, Commendation, and Contact in my conviction that your miners above all other workers will be glad to give their utmost if, in return, they can think better of themselves than ever before for giving it. By such understanding of their minds and hearts all miners can be better sold on their industry.



MAP OF SIAM, showing location of tin-mining operations and areas in the various provinces

Siam's Mining Industry Offers New Opportunities

JOHN J. CROSTON, Deputy Director, Metals and Minerals Division, Civilian Production Administration, Washington, D. C.

AMERICAN ATTENTION is being focused on the Siamese mining industry as an attractive field for future investment. For many years, it has been known that there were numerous occurrences of tin, antimony, lead, zinc, copper, manganese, molybdenum, iron, gold, tungsten, coal, and gem-stones in the Kingdom of Siam. Only tin, however, attracted appreciable foreign capital, and the extensive tin deposits in south Siam enabled the country to forge steadily ahead to the position of fourth largest producer prior to the war.

The deposits of some of the other metals are now beginning to attract attention, and doubtless we shall soon know their relative extent and value. The developed tin areas are all in the south, where the Government still holds a substantial amount of ground available

As this article goes to press, word has been received from the State Department of an announcement by the Premier of Siam that all parts of that country have been thrown open for mineral exploitation. The Premier states that he hopes the move will result in the beginning of a number of Siamese-American mining enterprises.

for working. Other tin-bearing areas here of considerable size are held by local banks, mercantile establishments, and individuals, awaiting development by foreign capital. Mining is prohibited in central and northern Siam, to reserve this part of the country for future exploitation. Additional discoveries during the war warrant belief that, when opened to development, northern Siam will be an important mining region for tin and other minerals.

Tin has been mined for hundreds of years in Siam and, together with Yünnan (Chinese) tin, formed the basis for Chinese and Indian bronze art. At the turn of the century, annual production was about 3,900 long tons in the form of concentrates. The rise since then is shown in Table I. The country's comparative position is indicated in Table II.

Early production was in the hands of the Chinese, both as proprietors and as laborers. In the first part of the century, only three "European" companies were in operation—a British company, a Dutch company in Kedah (now part of Malaya), and an American company in the Bangtaphan area. Later, the introduction of dredging called for large capital investment, and, as in Malaya, production by "European"-owned mines gradually increased, and at the outbreak of World War II amounted to nearly three-quarters of the total, Chinese and Siamese-owned mines contributing the remainder.

Table I—Tin Production of Siam 1900-1940

(Long Tons Tin Content)

Year Ending March 31	Tonnage	Percent of World Production
1900	3,900	4.57
1905	5,118	5.17
1910	4,719	4.05
1915	6,591	5.16
1920	8,325	6.81
1925	7,952	5.44
1930	10,009	5.69
1935	10,920	7.42
1940	17,447	7.42

Table II—World Production of Tin in 1940

(Long Tons Tin Content)

Country	Tonnage	Percent of Total
Malaya	85,384	36.33
Netherlands East Indies	44,563	18.96
Bolivia	37,940	16.15
Siam	17,447	7.42
Belgian Congo	12,377	5.27
Nigeria	10,257	4.37
China	6,249	2.66
Burma	5,500	2.34
French Indo-China	1,560	0.66
All other	13,723	5.84
Totals	235,000	100.0

Dredging Important

Dredging was introduced into Siam before it was practiced in Malaya, Burma, or the Netherlands East Indies. In 1906 the Tongkah Harbour Tin Dredging Co., N.L., was incorporated, with Tasmanian capital, to operate a dredge in the Puket area. The Siamese Tin Syndicate, Ltd., was formed the same year. Both companies are still in existence and have been large and profitable producers. Their success brought in other Australian and British tin enterprises in the period up to 1920. During the lush promotion of the late 1920's, under the spur of high tin prices or prospective share-market profits, London and Australia floated many dredging enterprises in Siam. By 1927 17 dredges were in operation and in 1931 38, this figure remaining approximately unchanged until war began in 1941.

In 1941, in addition, there were about 180 operations employing gravel-pumping, ground-sluicing, and open-cast methods, as well as those involving sinking in alluvium and on lodes.

When the troubulous years of overproduction arrived, a number of the weaker enterprises came under the control of either management companies or of holding companies, such as Anglo-Oriental (Malaya), Ltd., as in Malaya. Table III shows the growth of dredging output. The production was almost wholly by "European" companies.

Lode Tin Mines

Although almost all Siamese tin has come from alluvial operations, lode tin production may become increasingly important. The country appears to have more lode deposits than Malaya, especially in Nakhon Sithammarat Province, but little has been done to prove their extent or value.

Lode mining is scattered, the principal output coming from the Yala area. Most of the mines are domestically owned and are operated on a small scale. Straits and British capital control several mines. The only important property is the Pinyok, owned by Siamese Tin Mines, Ltd., organized in 1933 by British interests with participation of Patiño, Bolivian tin producer, who has an important financial interest in the Eastern Smelting Co., Ltd., at Penang. A small interest was held by American capital, which later disposed of it. Pinyok ore is very refractory and not amenable to successful extraction by the usual crushing and gravity concentration. After experimentation, a plant was built to treat it by leaching and producing electrolytic tin. The war prevented final determination of the operation's economic success, but the mine's huge reserves will undoubtedly compel continuation of work.

Location of Tin Areas

The operating mines are scattered throughout southern Siam in seven main producing areas. These are: the island of Puket and the *changwats* of Renong and Pangnga, on the West Coast; and Songkla, Nakhon Sithammarat, Surathani, and Yala, on the East Coast. These areas are well served by the southern line of the Royal State Railway, by motor roads, or by boat, although east of the west coast tin belt of Renong, Takuapa, Pangnga, and Puket, some areas are still difficult of access because of poor roads. The relative importance of the areas is shown in Table IV.

Reference to the accompanying map shows the location of the principal mines operated by foreign interests. Most of them are owned by British, Australian, or Straits Settlements capital, with a small amount of Dutch and Danish

* This article is based on visits to the centers of Far Eastern tin mining for the Reconstruction Finance Corporation, December 1945 to May 1946.

Table III—Output of Tin Concentrate in Siam by Mining Method, 1917-1937

(Long Tons)

Fiscal Year Ended March 31	Dredging (Gross Weight)	Other Methods (Gross Weight)	Total Concentrate (Gross Weight)	Total Tin Content
1917.....	4,022	N.A.	N.A.	8,765
1918.....	4,374	N.A.	N.A.	9,154
1919.....	4,449	N.A.	N.A.	8,835
1920.....	4,464	N.A.	N.A.	8,325
1921.....	3,513	N.A.	N.A.	6,201
1922.....	4,328	N.A.	N.A.	6,150
1923.....	4,084	N.A.	N.A.	6,979
1924.....	3,668	N.A.	N.A.	7,624
1925.....	4,329	6,715	11,044	7,952
1926.....	4,080	6,839	10,919	7,862
1927.....	3,136	7,055	10,191	7,338
1928.....	3,370	7,487	10,857	7,817
1929.....	4,843	6,993	11,836	8,522
1930.....	7,902	7,388	15,290	11,009
1931.....	9,712	6,925	16,637	11,979
1932.....	9,920	5,889	15,809	11,382
1933.....	8,468	5,017	13,485	9,709
1934.....	8,899	5,849	14,748	10,619
1935.....	8,624	6,543	15,167	10,920
1936.....	8,070	6,095	14,165	10,198
1937.....	11,303	7,142	18,445	13,280

Table IV—Production of Tin Concentrates in Siam by Provinces, 1940 Gross Weight

(Department of Mines, Bangkok)

Province	Long Tons
Pangnga	4,412
Phuket	3,576
Takuapa	3,452
Renong	3,231
Yala	2,718
Nakhon Sithammarat	1,576
Songkhla	1,439
Surat (Suranthani)	729
Chumphorn	615
Trang	367
Prachub	142
Rajaburi	74
Ampur-Baytong	66
Karnjanaburi	31
Narathivas	30
Total	22,458

money. At the outbreak of the war, about 40 dredges were in operation, of which all but three were controlled by British Empire capital. There were no dredging operations by American companies. Several foreign-owned companies were extracting tin ore by gravel-pumping, sluicing or lode mining. Although no American capital was invested in such mining, the Germans controlled several small properties, through local houses; and the Japanese firm of Mitsubishi had a small and relatively unsuccessful alluvial property. Chinese and Siamese accounted for the remainder. The greater part of the tin produced comes from alluvial mines—approximately 65 percent from dredging, 25 percent from gravel-pumping or other alluvial methods, and 10 percent from lode mines.

Siam Out of Tin Cartel

When the tin cartel was formed, Siam became a party to the International Tin Agreement in September 1931, and renewed the agreement in January 1934. During the meeting of the Cartel, Siam protested against its low quotas and insisted that the quotas for some countries were excessive and were based upon unrealistic and unattainable standard tonnages. Its adherence to the tin-output-restriction scheme in January 1937 was secured only by offering a substantial increase and reducing the quotas of some of the other signatories. On Dec. 2, 1940, Siam balked at signing the five-year extension and withdrew from the Cartel.

Siamese tin concentrates are in general of high purity, containing 65 to 74 percent tin, generally running better than 72 percent. Ores from the Yala district, however, yield concentrates varying from 45 to 70 percent and averaging about 55 percent. These contain an appreciable amount of lead.

Siam's Reserves Large

Whereas Malaya, Netherlands East Indies, and other areas have practically reached their maximum production, it is felt that Siam is still far from its potential peak output. The East Indies may reach a new high production within the next few years, due to the provision of eight new dredges now being built, to operate on previously developed acreage. Siam, however, has large untapped reserves, yet to be equipped with production facilities. The relative magnitude of the world's tin reserves is indicated in Table VI.

In each principal area in the peninsular *changwats*, the Siamese Department of Mines maintains offices to superintend the administration of the mining laws, to receive production reports, and to document export shipments (formerly inside the quotas fixed by the Department within the framework of the I.T.C. quotas for each country).

Prior to 1923, the Government assessed a royalty on concentrates on the basis of 70 percent contained tin. For 1923 and succeeding years it assumed a tin content of 72 percent. Actually, much of the production exceeds 74 percent. The producers in the Yala district, already mentioned, whose concentrates run as low as 55 percent tin, are penalized for the indicated impurity.

In prewar years, the royalty on tin was collected at the time of export at the custom house on the frontier or at the port. In 1942 and 1943, however, during the war, the Siamese Government found that Japanese buyers were exporting concentrates through Japanese military transports without paying royalties. In consequence, when ore is now shipped from the mine, it cannot be accepted by railways or steamers unless accompanied by royalty-payment receipts, issued by the producing district office.

The Wartime Years

When Siam came under the military control of Japan, the Siamese Government formed the Thai Minerals & Rubber Co., Ltd., to take over foreign tin enterprises, approximately 90 percent of the capital stock being held by the Government. Early in the war, this company operated about 24 dredges. At Puket, one of these dredges was bombed by a raiding plane, but otherwise their present condition is due to wear or lack of maintenance rather than deliberate damage. The wartime operations of the Thai company maintained employment in these areas to a certain degree.

Siam produced 10,879 long tons gross weight of tin concentrates containing 7,843 tons of tin during the calendar year 1942; 8,111 tons containing 5,840 tons of tin in 1943; 4,577 tons carrying 3,194 tons of tin in 1944; 2,465 tons containing 1,275 tons of tin in 1945, or a total of 26,032 tons containing 18,152 long tons of tin. Of this total, 25 percent came from Chinese- and Siamese-owned operations and 75 percent from "European" mines. The Thai Minerals & Rubber Co.'s operations were responsible for almost the entire output of the latter, with a small tonnage from the Siamese Department of Prisons, which operated a single dredge. Shutdowns, due to shortage of fuel and lubricants, kept individual output down. As time went on, the impossibility of securing maintenance parts resulted in "cannibalizing" some of the dredges, either to furnish parts for other dredges or for other purposes. This kept the wartime output from attaining more than half of the theoretical capacity.

The Japanese had no great interest in securing maximum tin production from this area. They had no vital need of tin from Siam, inasmuch as during the war they pro-

duced 31,354 metric tons of tin in the Netherlands East Indies and at the smelters of Penang and Kuala Lumpur they produced 78,797 metric tons of pig tin, mostly from Malayan operations. The 110,000 tons of pig tin so produced, plus small quantities from Indo-China, China, Hainan Island, and Japan, was more than enough for their needs and permitted the export of tin to Germany and Italy.

Siam sent no pig tin to Japan during the war but shipped 2,691 metric tons of tin in the form of concentrates. Most of these went to the Ikuno tin smelter of the Mitsubishi Mining Co., Ltd., on Honshu Island, with small amounts to the Totoro, Miike, and Oita plants, on Kyushu.

Tin Smelting Expands

For more than ten years prior to World War II, tin smelting in Siam was a negligible industry, as the small Chinese operators were unable to compete with the efficient smelters at Penang and Singapore.

With the scarcity of land transport and the dangers risked in sea transport, a wartime tin-smelting industry sprang up, which resulted in the erection of 18 smelting plants. Of these, six were owned by the Thai company mentioned, with two plants at Renong and one each at Puket, Pangnga, Takuapa, and Nakhon Sithammarat. Private industrial enterprise operated eight plants in Bangkok and vicinity, two in Takuapa, and one each at Puket and Trang.

These plants all used small charcoal-fired blast furnaces of Chinese design. Such smelters were inefficient, and lost much metal in smelting, either through the stack or in slags. Some of the plants did not recover much more than three-fourths of the tin and had mounds of high-tin slags full of prills, which some of the owners now hope to ship elsewhere for treatment.

Risks for Buyers

The Government exercises a degree of supervision over these smelters and the quality of their output. The pig tin so produced varied greatly in quality, nevertheless, although the 99½ percent tin was wanted. The ingots also varied greatly in weight, and many were poured with huge gas cavities. Brands from a given smelter varied in tin content from day to day. Acquisition of such stocks by inexperienced buyers will be fraught with possibilities of loss, and poses problems of sampling and analysis.

A ready market was found among local merchants and others for a large tonnage of the pig tin produced by these smelters. About 1,000 such individuals bought this tin, mainly as a hedge against inflation and devaluation of Siam's money. The Siam Government and some of the private smelters, feeling that there would be a good market after the war, were unconcerned about any unsold stocks of metal or concentrates. A certain amount of the tin was smuggled out of Siam during the war, and there has been smuggling in recent months because of the delay in foreign purchasing of Siamese tin.

Table V—Foreign Companies Operating in 1940 and Their Outputs of Tin Concentrates in 1940

Company	Nationality of Control	Province	Long Tons
Siamese Tin Syndicate, Ltd.	British	Renong	769
Siamese Tin Syndicate, Ltd.	British	Takuapa	998
Siamese Tin Syndicate, Ltd.	British	Surathani	480
Bangrin Tin Dredging, Ltd.	British	Renong	1,209
Renong Consolidated Tin Dredging Co., Ltd.	Australian	Renong	496
Tongkah Compound No. 3, N. L.	Australian	Renong	470
Nawng Pet Tin, Ltd.	Australian	Nakhon Sithammarat	119
Nawng Pet Tin, Ltd.	Australian	Songkhla	20
Ronpibon Tin, N. L.	Australian	Nakhon Sithammarat	415
Tongkah Harbour Tin Dredging, Ltd.	Australian	Nakhon Sithammarat	452
Tongkah Harbour Tin Dredging, Ltd.	Australian	Puket	419
Tongkah Harbour Tin Dredging, Ltd.	Australian	Takuapa	303
Ratrut Basin Tin Dredging Co., N. L.	Australian	Nakhon Sithammarat	326
Peninsula Tin, N. L.	Australian	Chumphorn	580
Puket Tin Dredging Co., Ltd.	Australian	Puket	291
Rangeng Tin, N. L.	Australian	Puket	291
Katu Tin Dredging, Ltd.	Australian	Puket	439
Kamra Tin Dredging, Ltd.	British	Puket	360
Krasom Tin Dredging, Ltd.	Straits Settlements	Pangnga	237
Pungah Tin Dredging, Ltd.	Australian	Pangnga	1,947
Kamunting Tin Dredging, Ltd.	British	Pangnga	1,300
Tin Songkhla, N. L.	Australian	Songkhla	312
Takuapa Valley Tin Dredging, N. L.	Australian	Songkhla	193
Takuapa Valley Tin Dredging, N. L.	Australian	Takuapa	705
Anglo-Siamese Tin Syndicate, Ltd.	British	Songkhla	218
Anglo-Siamese Tin Syndicate, Ltd.	British	Trang	211
Siamese Tin Mines, Ltd.	British	Yala	1,841
Pattani Tin, Ltd.	British	Yala	357
Straits Consolidated Tin Mines, Ltd.	Straits Settlements	Yala	182
Satupulo, N. L.	Australian	Takuapa	376
East Asiatic Co., Ltd.	Danish	Takuapa	398

Stocks at End of War

When the war ended about 16,400 tons of concentrates remained in Siam, containing perhaps 11,000 tons of tin, approximately 4,400 tons of pig tin. This totals about 15,400 tons of tin. In addition, concentrates containing 2,691 metric tons of tin were shipped to Japan. and some were smuggled out to other destinations. This accounts for somewhat more than the total wartime production, the difference doubtless coming from the prewar stocks on which I have no data.

Mining operations gradually came to a halt late in 1945, which added a few more months' production to the totals given. A small withdrawal has been made, due to small-scale smelting at a few plants. As of April 1946, smelting ceased, and there is little possibility that it will be resumed, because of the ready market for concentrates at the efficient smelter at Penang and the modern U. S. Government-owned plant at Texas City, Tex.

Since the War

The United States, never having declared war upon Siam, as did Britain, was not a direct party to the peace treaty, signed at the beginning of 1946. The original treaty between the Siamese and the British had been judged too harsh by the United States, and Great Britain eased some of her demands.

The British Siamese treaty concluded at Singapore on Jan. 1 last contained three provisions pertinent to Siamese tin: (1) "that the Siamese Government undertake to participate in any general international arrangements regarding tin or rubber which conform with such principles regarding commodity arrangements as may be agreed by the United Nations Organization or Economic or Social Council." (2) That until "a date or dates not later than Sept. 1, 1947, the Siamese Government undertake to prohibit, except in accordance with the recommendations of the Combined

Boards in Washington, or any successor of body (Combined Tin Committee) . . . any export . . . tin . . . and to regulate trade in and stimulate the production of these commodities." (3) That "the Siamese Government agree to assume responsibility for safeguarding, maintaining and restoring unimpaired, British property rights and interests in Siam and for compensation for losses or damage sustained. The term 'property rights and interests' shall include, *inter alia*, . . . stocks of tin . . . and tin . . . leases and concessions granted to British firms and individuals prior to Dec. 7, 1941, and still valid at that date."

On Jan. 1, 1946, when the present Combined Tin Committee replaced the Combined Raw Materials Board for the allocation of tin, tin concentrates ceased to be subject to international allocation, and there has been no legal restriction on the export of concentrates from Siam pursuant to the Singapore Agreement.

No U. S. Purchases Yet

Since Jan. 1, 1946, the Combined Tin Committee has recommended the allocation of 2,000 tons of tin metal to the United States. This country, however, has not as yet undertaken to purchase any metal in Siam, while trying to reach agreement with the British Government on procedures relating to the stocks of tin there.

Under the original plans, reparations were to be linked with a scheme for procuring wartime tin stocks and future output. At this point, the United States had a definite interest and insisted that Siam remain a sovereign nation; that America have a free access to the acquisition of stocks of pig tin and tin concentrates accumulated during wartime; that we share in purchases of future tin concentrate output; and that the Siamese receive American dollars for the pig tin or tin concentrates allocated to the United States, so that Siam may be in a position to make purchases in the United States of needed consumer goods and reconstruction items.

Discussions with the British were undertaken by the Department of State, and an arrangement has been worked out which, while making fair provision for payment of damages which British and Australian operators suffered, will accomplish the American objectives.

Table VI—World's Tin Ore Reserves

(Long Tons Recoverable Tin)

China	1,500,000	Bolivia	500,000
Malaya	1,500,000	Burma	300,000
N. E. I.	1,000,000	Nigeria	100,000
Siam	800,000	All other(*a*)	116,000
Belgian Congo	500,000	Total	6,316,000

(*a*) Exclusive of USSR, data on which are not available.

It is believed that American purchase of Siamese pig tin and concentrates will start soon.

How Texas Can Compete

Frequently one hears the question "How can we in the United States compete, when we have to haul concentrates from Siam to Texas, whereas the Penang smelter is only a short distance away?" This overlooks the fact that when Penang smelts the concentrate, the pig tin is in Malaya and will have to be shipped to consuming countries. When Texas City smelts the concentrate, the resultant pig tin is in the consuming country ready for immediate delivery. Tin concentrate has a high specific gravity and a very high dollar value per ton. Freight differentials are therefore relatively small. Furthermore, as long as our Texas City smelter treats Bolivian ores which are low-grade, it will be desirable to have a substantial tonnage of high-grade ores. Siam represents the only country to which the United States has access without permission of cartel members.

The United States consumes about one half of the world's tin production, and our ability to supply a substantial part of these requirements for pig tin is conditioned, not upon economics or technical ability, but upon international politics. This war has shown that a permanent tin-smelting industry is necessary for America's security. The smelter at Texas City is not in the category of a high-cost, inefficient, or poorly located war plant. It is exceptionally well located. It has efficient management, the most modern equipment, and very cheap acid and fuel costs, much below those of European or Far Eastern smelters, to offset higher labor charges. Private enterprise is willing to take it over or even to erect others, provided it is assured an unrestricted opportunity to purchase an adequate supply of suitable tin concentrates. Thus, the future of Siam's tin-mining industry has a direct bearing upon the successful operation of any American tin smelter, and every effort is being made to see that any tin miner in Siam who wants to sell to the United States can do so without restrictions.

Current Opportunities

During the Japanese occupation, the United States cooperated with the "underground" in Thailand, in which group were most of the important political personages in the Kingdom. America maintained an extensive OSS unit in that country, and, in consequence, there exists a strong pro-American feeling throughout the Kingdom.

The present government, as well as members of recent governments, desires to attract American capital to Siam for investment in mining and other enterprises. Feeling that their independence and progress will be more secure when many nations have a stake there, the Siamese desire foreign capital from diverse nations, rather than a development almost entirely in the hands of one foreign nation. Talks with the heads of various Government departments and political leaders have manifested the country's eagerness for American mining companies to participate in the postwar development of Siam. American companies interested in the legitimate development of Siamese industry, it would seem, can be reasonably assured of cooperation on the part of the Government.

A Safety Suggestion from Flin Flon

THE TENDENCY of a stoper to swing if a steel gets stuck and thus jam the operator's hand between the handle and rock wall frequently causes mine accidents. Eric Runehjelm, safety director, Hudson Bay Mining & Smelting Co., Flin Flon, Manitoba, writes that these accidents may be prevented by welding an elliptical piece of boiler plate about the size of a ping pong racket to the top of the handle. This shape was chosen intentionally to prevent the operator from gripping the shield instead of the handle. When the stoper twists, the flat shield will strike the rock first and protect the miner's hand.

Well Planned Pump Station Reduces Maintenance Costs

A. E. ALPINE, Mechanical Superintendent, Aunor Gold Mines, Ltd., Timmins, Ontario

Maintenance and labor costs have been reduced substantially because this pumping station was well planned. Recognizing this, numerous mines have changed over to this type of installation.

AN EASILY CLEANED SUMP, positive suction head, and facilities for water clarification are features frequently omitted in poorly planned pumping stations. This installation incorporates them, and as a result has greatly reduced replacement and repair of plungers, fittings, and brass impellers. These economies are due largely to the sump arrangement, which permits abrasive particles to settle out almost completely before water enters the suction line.

The ideal site for a pump station is four or five sets below a station, to facilitate drainage from overlying levels and to isolate the pump and panel from loitering workers. The illustrated sump is Y-shaped because it facilitates scraper loading into cars or directly into skips during cutting. The Y-shape also forms a good wedge against which the concrete dam can be poured. An 8-in. channel iron grouted in the dam between the receiving sump and the suction sump minimizes agitation as water passes over the dividing dam.

Drainage water from the shaft line discharges into a wooden launder at the back of the settling sump. Turbulence is absorbed in the launder, and the water flows slowly forward and over the dividing dam. Heavy settlings collect against the dam. The suction pipe intake is belled out and inclosed in a screen-covered concrete box at the rear of the settling sump.

The two sumps are connected to a 12-in. pipe clean-out Y so constructed that each sump may be cleaned independently. When one sump is cleaned, drainage is directed entirely to the other sump. The clean water is drained into the operating sump through 4-in. pipes connecting the two sumps through the dividing dam. By opening the clean-out valve quickly, most of the settlings discharge into a mine car placed under the clean-out door. Some hand mucking is necessary prior to washing down, but two men can clean one sump completely in two hours, whereas previous methods with a tugger hoist and bucket required eight men for one shift.

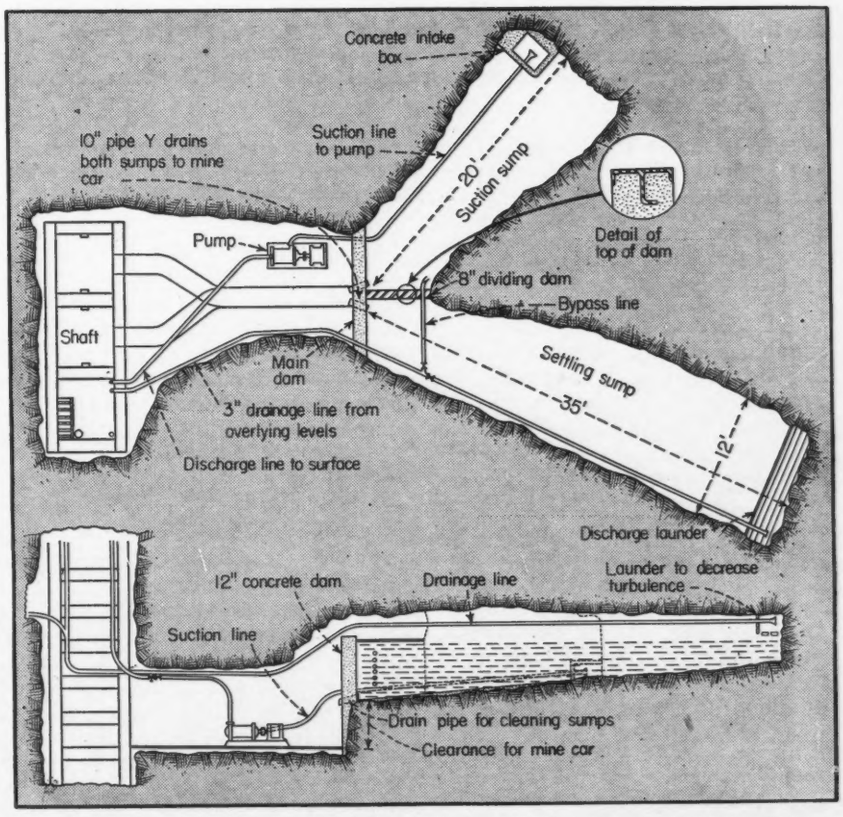
Advantages of this arrangement are:

1. High-level suction. This is necessary for automatic operation of the pumps.

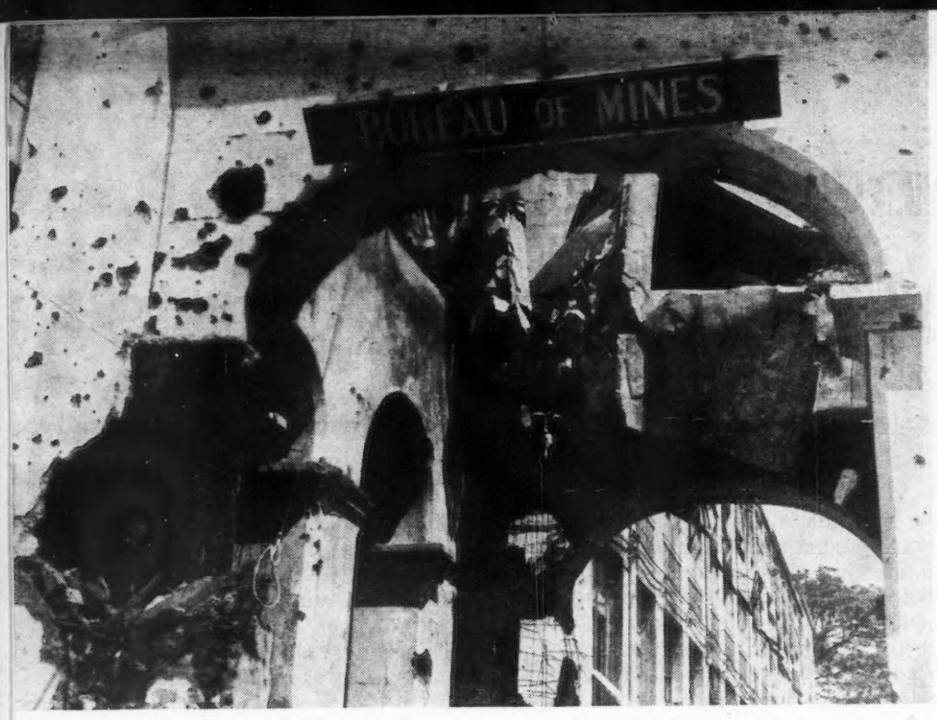
2. Clean water. This lengthens the life of impellers, valves, glands, and plungers.

3. Simplified sump mucking. At best, sump muck is messy to handle. This system obviates many disagreeable features of a sump-mucking shift.

One mine in the Porcupine camp has improved this arrangement by installing an I-beam and chain-block trolley directly over each pump and motor. A spare pump and motor are kept in readiness on the surface, and may be installed in half an hour. Long-radius pipe sweeps, concrete floors, and painted equipment contribute much to the neatness of the installation.



TWO SUMPS IN SERIES allow solids to settle out. Turbulance is prevented by launder at rear of settling sump, and the dividing dam between the settling sump and the suction sump. Sump muck is removed through drain pipes in dam.



THE ENTRANCE to the Bureau of Mines after the building had been taken from the Japanese

Destruction by shell fire and losses through looting have left this division of the Government of the new Republic greatly in need of laboratory equipment and technical books

Mines Bureau at Manila Suffered Heavily in War

H. FOSTER BAIN, Adviser on Mines, Philippine Government

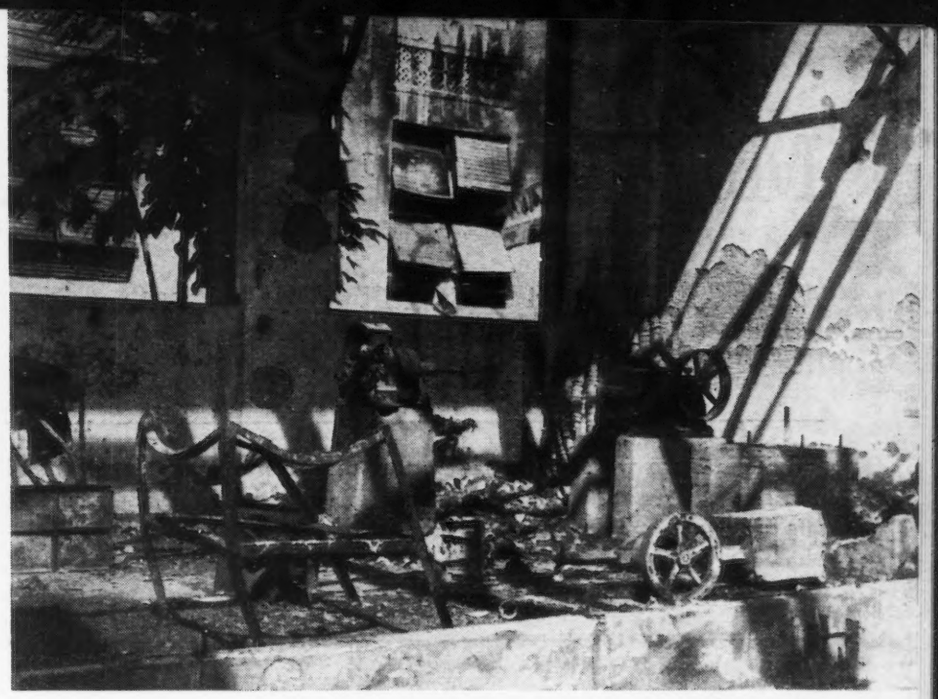
WHAT HAPPENS to a technical bureau housed in a reinforced concrete building when it is subjected to shelling followed by fire is shown by the accompanying pictures. The illustrations are of the Commonwealth Bureau of Mines wing of the Bureau of Science building in Manila, which was used as a fort by the Japanese in opposing the recovery of the city last year by the American forces. The building was a large and substantial structure built around three sides of a court, with a power house and an assay laboratory in the latter and with a row of single-story technical laboratories across the fourth side of the court but detached from the main building. It was adjacent to the buildings of the University of the Philippines and they, in turn, adjoined those of the Philippine General Hospital. All of these were badly damaged, but the Science-Mines building suffered most and was all but destroyed.

The building was originally erected, and was enlarged from time to time, to house the Bureau of Science, a most useful institution that had been carefully nurtured from the early days of the original American occupation. In the Bureau of Science was a Division of Mines which accomplished a considerable amount of geological and paleontological work of a basic character and in later years made extensive studies of the mineral resources of the Islands, such as the first survey and systematic sampling of the iron deposits. About the time the Commonwealth was established, the gold mines assumed large importance, and the new government found itself faced by a mining boom involving many intricate questions. By appropriate legislation the Division of Mines was joined to the Mineral Land Division of the Land Office to form a Bureau of Mines as a distinct unit, which, however, continued to occupy a wing of the Bureau of Science building and to maintain a joint library which was one of the best collections of scientific and technical books in the Far East. Foreign advisers were brought in to assist the regular staff, and the National Development Co., a wholly government-owned concern operating along commercial lines, was brought into cooperation. Coal mines were opened, an extensive petroleum geological survey was completed just before the invasion, a system of mine valuation set up, a mine inspection service put into operation, and a strong movement, in cooperation with the mine operators, was created to improve the health and safety conditions in the mines. The output of the mines rose rapidly and mining became the second most important industry in the Islands.

All this was stopped by the Japanese invasion. The invaders made no attempt to foster or operate the mines, except in the case of the Mankayan copper mine and a limited amount of work in a few others. Instead, the mine staffs and labor were scattered and the plants systematically looted. In the end, the plants not already destroyed were mainly burned.

This general catastrophe affect-

ing the mines was reflected in the corresponding disruption of the Bureau of Mines. The foreign staff was scattered, some members going into the army and becoming prisoners of war or, after the surrender, guerrillas; some kept their civilian status and became internees. The Filipino members of the staff did likewise and became scattered, though a nuclear organization was maintained, essentially in idleness, during the period of the puppet government. One of the American geologists, Frank Merchant, died in a prisoner-of-war camp in Japan, and the very capable director of the Bureau, Quirico Abadilla, a graduate of Colorado School of Mines, was killed in the fighting to recover Manila. Some twenty other members of the Bureau staff of subordinate rank lost their lives in one way or another, but by May 1946, 88 of the permanent employees had reported for duty and been reinstated, as compared with 121 in active service in December 1941. It was to the building and conditions shown in the pictures that they came, and here they have since been engaged in doing what was possible with what was left. The Government, itself living on a deficit basis, was able to spare very little for field expenses and only prewar salaries, despite the great increase in the cost of living. Nothing has been available as yet for rehabilitation and reconstruction, the Government as well as private industry having to wait in the main for war damages. Only in October has the War Damage Corporation begun to function at Manila.



DESTRUCTION in the Bureau's assay laboratory. As the crushing room appeared after the fighting was over.

The members of the Bureau, under the leadership of Demetrio Andres, officer in charge and former assistant director, cleared away rubbish, got some sort of a roof over part of the rooms, repaired file cases and a limited amount of furniture, and started to work. Their first efforts were directed toward salvage and particularly of records of mining titles. In this they were more successful than might have been anticipated, thanks largely to duplicates at the various Provincial capitals. Very little field work has been possible, though a number of the devastated mines have been visited. The U. S. Geological Survey loaned to the Bureau two of its staff, and though one has been necessarily recalled, owing to lack of funds, the other is still on the ground, thanks to the cooperation of the United States Army Engineer Corps. An immense amount of urgent work faces the Bureau in connection with rehabilitation and reconstruction, but it lacks equipment of all kinds and the library was systematically looted by the Japanese even before the final fighting, in the course of which what remained of the equipment was destroyed.

Inasmuch as it will necessarily be some time before the new Republic will have funds, and the market can supply the books and instruments needed, an appeal is being made to the profession at large to contribute from their surplus of both. At Washington, both the Geological Survey and the Bureau of Mines are preparing shipments, and in New York the A.I.M.E. is accumulating books for a direct shipment. Since the Scientific Exchange service long maintained by the Smithsonian Institution is still interrupted, it will be necessary to rely on private initiative. Forwarding charges from this country will be cared for by the Philippine Republic and the books and instruments that are given will be put to the highest use. Any contribution will be most gratefully received, and it is believed that the reestablishment of a sound mining industry in the Philippines will do most to assure the future of our daughter Republic.

RUINS of the main building, Bureau of Science

Making Tin Flotation Work—

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Seldom have we seen so much new and useful material crammed into so small a space as in this article. Because work such as this affects directly everyone interested in ore dressing, whether of sulphides or non-sulphides, we urge a most careful reading.

The Editors

THE COLQUIRI MINE, near Oruro, Bolivia, the country's second largest tin producer, has been developing and treating a complex orebody that features certain unusual mineral associations. A gradual lowering in grade of the ore has placed an increasing load on the present gravity-concentration mill, with the result that tin losses have increased and product grade has deteriorated. It is against this background, as well as in view of the development of substantial reserves of very low-grade ore, that one must consider the present research into the selective flotation of the Colquiri ore and of the Colquiri low-grade concentrate.

This investigation has been carried out under cooperative agreements between the sponsors, Messrs. Mauricio Hochschild, S.A.M.I., on the one hand, and the Division of Industrial Cooperation of the Massachusetts Institute of Technology and one of the authors on the other. The research extended from February 1943 to March 1945.

The material studied consisted of two samples of low-grade gravity concentrates shipped to the Institute from the Texas City smelter of Tin Processing Corporation, and of three successive samples of run-of-mine ore of gradually lower tin content shipped directly from Bolivia. Analyses are presented in Table I.

Mineralogy

The Colquiri ore contains an unusually large number of minerals, both sulphides and non-sulphides (see accompanying table), a circumstance from which the flotation problems stem. The ore lots tested ranged from about one-half sulphides, one-half non-sulphides (Sample I) to about one-third sulphides, two-thirds non-sulphides by weight (Sample III).

Textural and structural features of the ore have not caused really serious difficulties. Through much of the flotation testing program a batch grind to minus-100 mesh (about 70 percent minus-200 mesh) gave satisfactory liberation. However, one or two regrind steps ultimately might prove advantageous in treating intermediate products containing locked particles such as cassiterite to sulphide, cassiterite to siderite, and valuable sulphide to gangue sulphide.

The low-grade gravity concentrate is mineralogically less complex. It consists principally of cassiterite, siderite, a few percent of fluorite, and minor quantities of sulphides (especially marmatite) and foliated silicates. The siderite in these samples was darker in color than that in the ore samples, probably because the concentrates had been heated in drying.

TABLE I. Feed Sample Analyses

	Low-Grade Gravity Concentrates		Run-of-Mine Ores		
	I	II	I	II	III
Tin, total	25.0	19.8	3.58	2.23	1.70
Tin, acid-soluble (a)			0.17	0.15	
Tin, insoluble (b)			3.41	2.08	
Iron, total			31.3		
Iron, acid-soluble (c)			8.9	6.6	
Silica			14.0		
Sulphur	1.00	3.45	20.3		

(a) Tin as stannite. (b) Tin as cassiterite, by difference. (c) Mainly as siderite.

TABLE II. Screen Analysis of Flotation Feed (Ore Sample II)

Screen Size Tyler Mesh	Millimeters	Weight Per Cent Retained	Cumulative Per Cent Fines
65	0.208	0.1	99.9
100	0.147	0.8	99.1
150	0.104	6.1	93.0
200	0.074	15.5	77.5
270	0.052	10.1	67.4
Minus 270	Minus 0.052	67.4	
Total		100.0	

Flotation Tests, General

In broadest lines, the flotating testing involved the development of a number of unit processes of flotation, employing three collector types (xanthate, oleic acid, and long-chain amines) and a considerable variety of chemical conditions and modifying agents. More than 1,000 batch flotation tests were carried out, many of the individual tests having five, six, or more flotation operations, including cleaning steps. As a sidelight, it is estimated that test work required well over 10,000 individual pH measurements on flotation pulps. The prospect of conducting such work without a convenient, electrometric pH meter would have been discouraging indeed.

In critical tests of complete concentration schemes including two or more unit processes, a roughing and at least one cleaning step were common for each unit process, and rougher and cleaner tailings were generally combined as feed for the next step. Exploratory tests were

No. III, Colquiri Ore (Part I)

on 750-gram batches of ore, most tests of complete processes were on 3,000-gram batches, and a few tests were made on multiples of 3,000 grams. Fagergren 600 and 1,000-gram cells and a Denver 2,000-gram cell were used. Reagent quantities are expressed herewith as pounds per ton of original raw material, to simplify accounting.

Grinding

Stock ores were dry-crushed to minus-20 mesh, and each batch for testing was wet-ground individually. For 750-gram batches, 1-gallon Abbe jar mills with 4.0-kg. porcelain pebbles or with 8.0-kg. steel balls were used. For 3,000-gram batches an 8x8-in. steel mill with 13-kg. steel balls was used.

Except for a few experiments mentioned later, the screen analysis of the original flotation feed was close to that given in Table II, which might be described as a 100-mesh grind. A light grind sufficed to prepare the low-grade gravity concentrate for testing.

Sulphide Flotation

It appeared at once that bulk flotation of all the sulphide would be a logical first step in concentrating the mine ore. Later attempts to skip the sulphide flotation or to combine it with other steps were not successful.

The investigation involved use of xanthates, amines, and oleic acid, respectively, as collectors. Using amine collectors, the pyrrhotite was not floated, but was easily removed by wet magnetic separation after floating the other sulphides. On the whole, consideration of all the accumulated data discloses no definite metallurgical advantage on Colquiri ore for any one of the three methods. In other respects, however, there are considerable differences, as will be brought out. Data on bulk sulphide flotation appear in Table III.

Xanthate Floats.—When using xanthate, copper sulphate is necessary for complete flotation of pyrrhotite and marmatite, though a major portion of each of these minerals can be floated without added activator. Potassium amyl xanthate (Z-5) was used in most of the

Mineral Composition of Colquiri Ore

Principal tin mineral:
- Cassiterite (2–5%)

Possibly valuable sulphides:
- Marmatite (3–4%)
- Stannite (0.5–1%)
- Galena (less than 0.5%)

Gangue sulphides: (25–40%)
- Pyrite
- Pyrrhotite
- Marcasite

Gangue non-sulphides:
- Siderite (20%)
- Quartz (5–20%)
- Foliated silicates, micas, chlorites, kaolin (15–20%)
- Fluorite (3–5%)

Minor minerals such as tourmaline, magnetite, and goethite (total less than 1%)

TABLE III. Bulk Flotation of Sulphides

Test No.	Collector	Reagents: Kind	Lb. Per Ton	pH	Products	Weight %	Tin: Assay %	Tin: % of Total	Sulphur: Assay %	Sulphur: % of Total
					A. Tests on Ore Sample I					
240	Amyl xanthate	Grind: Pebble mill, 35 min.			Cleaner froth	48.7	0.52	6.6	43.4	97.6
		Rougher:			Cleaner non-float	2.7	3.26	2.3	2.15	0.3
		Copper sulphate	0.4	4.1	Rougher non-float	48.6	7.20	91.1	0.95	2.1
		Amyl xanthate (Z-5)	0.4	to						
		Pine oil	0.1	4.7	Calculated feed	100.0	3.84	100.0	21.7	100.0
		Cleaner:								
		Pine oil	0.5	4.8						
105	Amyl xanthate	Grind: Pebble mill, 60 min.			Cleaner III froth	43.5	0.43	4.6		
		Rougher:			Cleaner III non-float	0.9	0.97	0.2		
		Copper sulphate	2.0		Cleaner II non-float	1.3	2.16	0.7		
		Amyl xanthate (Z-5)	0.5		Cleaner I non-float	5.6	4.15	5.7		
		Pine oil	0.2		Rougher non-float	48.7	7.50	88.8		
		Cleaner I, II, & III:								
		Pine oil, each	0.2		Calculated feed	100.0	4.10	100.0		
193	Amine	Grind: Pebble mill, 35 min.								
		Reagents to grind:			Cleaner froth	39.1	0.54	6.3	43.0	83.7
		Sodium hydroxide	14.7	11.1	Cleaner non-float	3.5	1.64	1.7	12.6	2.2
		Sodium metasilicate	2.7		Magnetic conc.	5.5	0.16	0.3	35.3	9.7
		Rougher:			Rougher non-float, non-magnetic	51.9	5.90	91.7	1.70	4.4
		Sodium hydroxide	0.8							
		Amine AM 118.5—B+	0.25							
		Terpineol	0.03		Calculated feed	100.0	3.34	100.0	20.1	100.0
		Cleaner:								
		Sodium hydroxide	0.27	10.7						
		Amine AM 118.5—B+	0.07							
		Terpineol	0.04							
					B. Tests on Ore Sample II					
874	Amyl xanthate	Same as in test 240, above			Cleaner froth	39.5	0.53	9.5		
		Grind: Pebble mill, 35 min.			Rougher and cleaner non-floats	60.5	3.21	90.5		
880	Oleic acid	Grind: Pebble mill, 35 min.			Calculated feed	100.0	2.21	100.0		
		Rougher:			Cleaner froth	40.0	0.54	9.7		
		Sulphuric acid	10.0	1.9	Rougher and cleaner non-floats	60.0	3.36	90.3		
		Oleic acid	0.4	to						
		Nujol	0.5	2.4						
		Pine oil	0.1							
		Cleaner:			Calculated feed	100.0	2.24	100.0		
		Sulphuric acid	2.4	2.2						
		Pine oil	0.06							
982	Ethyl xanthate	Grind: Steel mill, 30 min.								
		Rougher:			Cleaner froth	41.1	0.48	8.1		
		Copper sulphate	0.5	5.9	Rougher and cleaner non-floats	58.9	3.79	91.9		
		Ethyl xanthate (Z-3)	0.5 to	5.0						
		Pine oil	0.8							
		Cleaner:								
		Pine oil	0.04		Calculated feed	100.0	2.43	100.0		
					C. Test on Ore Sample III					
1010	Ethyl xanthate	Grind: Steel mill, 30 min. Same as in test 982, above			Cleaner froth	32.3	0.51	9.8		
					Rougher and cleaner non-floats	67.7	2.24	90.2		
					Calculated feed	100.0	1.68	100.0		

TABLE IV. pH Values and Dissolved Iron During Grinding and Sulphide Flotation

Type of Grind	pH		Ferrous Iron in Solution, (b) Grams per Liter	
	After Grind (a)	After Sulphide Float	After Grind (a)	After Sulphide Float
Porcelain	4.3	4.5	0.14	0.09
Steel	6.0	5.0	0.42	0.28

(a) "After grind" data were for pulp in flotation machine just after dilution with distilled water and before any reagent addition.
(b) Also total iron, for ferric would probably precipitate at these pH values.

early tests, but in the end showed no advantage over the ethyl xanthate (Z-3) to balance its higher cost. Long conditioning, pH variations from the natural pH after grinding, addition of reagents in grinding, use of hydrocarbon oil, and staging of reagents were not found beneficial.

Visual differences were noticeable between the behavior of pulps ground in porcelain pebble mills and the behavior of those ground in steel ball mills. The data in Table IV give some indication of the large chemical differences between porcelain-ground and steel-ground pulps, yet neither pH correction nor other reagent adjustments would make the pulps from the steel mill behave as well as those from the porcelain mill. However, these differences did not noticeably affect metallurgical balance or prove serious in any of the complete processes tested, and a steel-mill grind was used in all critical tests.

Amine Floats.—The chief requirement in floating the sulphides from the non-sulphides (from cassiterite in particular) with amine collectors is that sufficient alkali be used to maintain a pH near 11 or higher. Primary, long-chain amines have been used, such as lauryl amine and Armour's AM-118.B (a mixture of octadecyl, hexadecyl, and octadecenyl amines). The large alkali consumption and the failure to float pyrrhotite constitute the most serious objections to the use of this process on Colquiri ore. However, it is worth noting that the inability to float pyrrhotite while floating other sulphides might be, on other ores, a desirable characteristic; for example, in floating marmatite from pyrrhotite.

The principal reason for seriously considering the amine flotation as a means of separating the sulphides was the belief that grinding and floating in an alkaline circuit would reduce or eliminate troublesome reactions among the minerals, the solution, the air, and the grinding mill. However, as will be described, those difficulties were met eventually by other means.

Oleic Acid Floats.—For other tin ores tested in this laboratory, bulk flotation of sulphides with oleic acid as collector has proved satisfactory in circumstances where xanthate floats have been difficult. For the Colquiri ore ground in steel mills, the oleic acid floats give more complete flotation of slimed sulphides and are somewhat better mechanically than the xanthate floats.

The best conditions using oleic acid as collector (See Test 880, Table III) involve a pH preferably 2 or lower, short conditioning time (about one minute), and supplementary additions of hydrocarbon oil and frother. The sharp pH rise during conditioning and flotation indicates that substantially complete consumption of the acid by the ore (probably dissolution of siderite) occurs in a few minutes. Thus the conditions for the oleic-acid sulphide float are believed to result in greater formation of dissolved salts (particularly ferrous sulphate) than either of the other two sulphide flotation schemes. If water recovery, treatment, and re-use are to be practiced, it appears likely that against the oleic acid process there must be charged an added consumption of water-treating reagents roughly equivalent chemically to the 10 lb. sulphuric acid per ton used in flotation.

Selective Flotation of the Sulphides.—Selective flotation tests carried out on the bulk sulphide products showed that the valuable sulphides could be readily separated from the iron sulphides. Also, exploratory tests indicated that the valuable sulphides could be concentrated further by floating a galena-chalcopyrite-stannite product while depressing marmatite.

Desliming Avoided

Sufficient soluble salts remain in the non-float products of bulk sulphide flotation to require treatment to remove them before non-sulphide flotation proceeds. Means were discovered, however, of avoiding a desliming step.

Many tests were made in an attempt to float non-sulphides without prior removal of soluble salts. The aim was to complex, precipitate, or otherwise control the various ions in the flotation cell itself, but no satisfactory results were ever reached on this basis.

Because the non-float pulp from xanthate or oleic acid floats are acidic, well-flocculated, and settle readily, simple decantation serves to remove soluble salts. The process through this point then became: (1) a sulphide float started at 3:1 pulp dilution (water : solids) left a non-float pulp of 4.5:1; (2) decantation of clear liquid thickened this pulp to 0.75 to 1; (3) distilled water was added to a dilution of 4:1, and non-sulphide flotation could proceed. Thus about 80 percent of soluble salts was eliminated. More elaborate washing to a theoretical 99 percent removal resulted in no clear-cut improvement in flotation.

Perhaps this simple decantation wash is of general applicability, and even where soluble salts are controlled by reagent additions, the wash might be more economical or give better control. Water supply problems are discussed in a later section.

In most early tests, desliming preceded non-sulphide flotation, but eventually the development of a satisfactory soap flotation technique and the use of the washing procedure made desliming unnecessary. A review of older data now suggests that desliming prior to amine flotation is truly useful in removing siliceous slimes that consume amine and otherwise interfere, but that desliming prior to soap flotation is only a roundabout attack on the soluble salt problem.

Amine for Non-Sulphides

Because amines are regarded chiefly as silica floaters, it is of interest to note that on Colquiri ore quartz is the last mineral to float with amine under any of the test conditions, which include a wide range of pH and auxiliary agents. It was hoped originally that an amine could float cassiterite alone (note the parallelism between

SnO_2 and SiO_2), but this hope was blasted.

Contrariwise, a simple and effective process was discovered for floating siderite away from the other non-sulphides, principally cassiterite, by using amines at high pH. Also, it was found possible to separate cassiterite, fluorite, and quartz from one another in acid circuit with certain modifiers. Finally, it was confirmed that, among sulphides, foliated silicates and especially the clay minerals are floated preferentially by amines under the conditions met in our work.

Long-Chain Amines Used

Chiefly long-chain amines were used, particularly Armour's AM-Coco-C,[1] AM-1120,[2] and AM-118.5B.[3] They worked equally well, but AM-Coco-C is preferred because of lowest price, least amount required, and best froth character. These were used as water emulsions of the hydrochlorides containing from 2 to 5 percent amine by weight, prepared as directed by H. M. Corley, of Armour & Co. Exploratory tests were made with other amines, but with the possible exception of n-octyl-amine, none did as well as the three named.

Amine for Siderite

Siderite was first floated[4] successfully from the low-grade Texas City gravity concentrate, in which siderite and cassiterite are the two most abundant minerals; in fact, as a result it was at once recommended that an amine float be installed at Colquiri to improve the product sent to the United States.

Later the process was applied to the mine ore and found to work well in various combination processes, whether preceding, following, or acting jointly with a soap flotation. Under certain requirements, herewith discussed, siderite, foliated silicates, and sulphides (except pyrrhotite) float, while cassiterite, fluorite, and quartz do not. The same conditions are effective: in floating calcite, rhododrosite, or barite from cassiterite (artificial mixtures); in

[1] Technically pure mixture of primary amines corresponding in Alkyl chain length to fatty acids derived from coconut oil. Purity is 90 percent mono-amine, based on mean molecular weight of 200.

[2] Mono-n-dodecyl amine, C.P. (98 percent purity on molecular weight of 185).

[3] Mono-n-octadecyl, 25 parts; mono-n-hexadecyl, 25 parts; mono-n-octadecyl, 50 parts. Purity is 99 percent on molecular weight of 264.

[4] U. S. Patent No. 2,381,662.

TABLE V. Flotation of Siderite (and Foliated Silicates) With Amines

Test No.	Reagents: Kind	Reagents: Lb. per Ton Orig. Ore	Reagents: pH	Products	Tin: Weight, %	Tin: Assay, %	Tin: % of Total
	1. Tests on Low-Grade Gravity Concentrate, Sample No. 1, No Desliming						
LG-65	Rougher:			Siderite cleaner froth	51.1	1.78	3.8
	Sodium hydroxide	16.0	11.6	Cleaner non-float	7.3	24.3	7.3
	AM-118.5-B	2.6		Rougher non-float (tin concentrate)	41.6	51.6	88.9
	Calgon	1.0					
	Sodium arsenate	4.0					
	Pine oil	0.67		Calculated feed	100.0	24.2	100.0
	Cleaner:						
	No reagents						
	Sample No. 2, No Desliming, but Has More Slimes Than No. 1						
LG-144	Rougher:			Siderite cleaner froth	53.8	2.87	7.9
	Sodium hydroxide	25.2	11.5	Cleaner non-float	13.3	18.2	12.5
	AM-118.5-B	4.0	to	Rougher non-float (tin concentrate)	32.9	47.0	79.6
	Gas oil	3.0	11.3				
	Pine oil	1.0					
	Remove very voluminous, lightly mineralized froth, then continue with:			Calculated feed	100.0	19.4	100.0
	Sodium hydroxide	3.8	11.4				
	AM-118.5-B	0.5					
	Pine oil	0.4					
	Cleaner:						
	Sodium hydroxide	3.0	11.4				
	Sample No. 2, With Desliming:						
LG-142	Desliming (two steps):			Siderite recleaner froth	52.9	1.87	5.1
	Sodium hydroxide	12.0	11.4	Recleaner non-float	4.1	20.2	4.3
	Sodium metasilicate	16.0		Cleaner non-float	8.3	38.8	16.7
	Rougher:			Rougher non-float (tin concentrate)	22.2	59.6	68.4
	Sodium hydroxide	6.0	11.7				
	AM-118.5-B	2.0	to	Slimes	12.5	8.50	5.5
	Pine oil	0.4	11.3				
	Cleaner:			Calculated feed	100.0	19.3	100.0
	Sodium hydroxide	1.6	11.4				
	Recleaner:						
	Sodium hydroxide	2.0	11.4				
	Sample No. 2, With Washing and Desliming						
SP-7	Washing:			Siderite cleaner froth	52.5	1.42	3.9
	Concentrate diluted to 4:1, filtered; filtrate discarded. Cake repulped in distilled water.		5.0	Cleaner non-float	5.1	30.1	8.1
				Rougher non-float (tin concentrate)	31.2	50.5	82.5
				Slimes	11.2	9.24	5.5
	Desliming (one step only):			Calculated feed	100.0	19.1	100.0
	Soda ash	6.0					
	Sodium metasilicate	6.0					
	Rougher:						
	Sodium hydroxide	4.2	11.7				
	AM-118.5-B	1.5	to				
	Gas oil	3.0	11.4				
	Pine oil	1.4					
	Cleaner:						
	Sodium hydroxide	1.8	11.6				
	AM-118.5-B	0.3					
	Pine oil	0.3					
	2. Tests on Non-Float From Bulk-Sulphide Flotation (Xanthate)						
	Ore Sample 1, Without Desliming Step:						
41	Siderite rougher:			Rougher non-float (tin product)	14.9	17.8	76.6
	Sodium hydroxide	3.0		Siderite rougher float	38.2	1.36	15.0
	Sodium metasilicate	10.0		Bulk sulphide product	46.9	0.62	8.4
	AM-118.5-B	1.0					
	Remove light but very voluminous froth. Then continue with:			Calculated feed	100.0	3.46	100.0
	AM-118.5-B	1.0					
	Pine oil	0.2					
	Ore Sample 1, With Desliming:						
85	Desliming (two steps):			Non-float (tin product)	10.9	20.4	69.4
	Sodium metasilicate	10.0		Cleaner non-float	6.9	6.17	13.3
	Siderite rougher:			Siderite cleaner froth	29.9	0.77	7.2
	Sodium hydroxide	2.2	11.3	Slimes	9.5	0.83	2.5
	Soda ash	2.0	to	Bulk sulphide product	42.8	0.57	7.6
	AM-1120	1.7	11.2				
	Pine oil	0.2		Calculated feed	100.0	3.20	100.0
	Siderite cleaner:						
	Sodium hydroxide	0.8					
	Pine oil	0.2					
97	Desliming (two steps):			Rougher non-float (tin product)	15.6	17.0	77.
	Sodium metasilicate	14.0		Cleaner non-float	2.8	7.52	6.1
	Siderite rougher:			Recleaner non-float	2.2	2.78	1.8
	Sodium hydroxide	1.5	11.4	Siderite recleaner froth	22.4	0.39	2.5
	AM-118.5-B	1.25	to	Slimes	11.0	0.85	2.7
	Gas oil	2.0	11.1	Bulk sulphide product	46.0	0.70	9.4
	Pine oil	0.13					
	Siderite cleaner:						
	Sodium hydroxide	0.5	11.4	Calculated feed	100.0	3.43	100.0
	Pine oil	0.06					
	Siderite recleaner:						
	Sodium hydroxide	0.5					
	Pine oil	0.06					

(*Continued on next page*)

TABLE V (continued)

Test No.	Reagents: Kind	Reagents: Lb. per Ton Orig. Ore	pH	Products	Weight, %	Tin: Assay, %	Tin: % of Total
	Ore Sample II, With Desliming:						
314	Desliming (two steps):			Combined non-float (tin product)	13.8	12.5	74.2
	Sodium metasilicate	14.0		Siderite cleaner froth	32.1	0.79	10.9
	Siderite rougher:			Slimes	14.9	0.70	4.5
	Sodium hydroxide	2.0	11.7	Bulk sulphide product	39.2	0.62	10.4
	AM-118.5-B	1.0	to				
	Gas oil	2.0	11.3				
	Pine oil	0.15		Calculated feed	100.0	2.33	100.0
	Siderite cleaner:						
	Sodium hydroxide	0.5	11.6				
	Pine oil	0.03					
	3. Test on a Soap Flotation Product Ore Sample II						
298	Siderite rougher:			Rougher non-float	1.7	62.6	44.1
	Sodium hydroxide	0.5	11.3	1st cleaner non-float	0.9	39.5	14.8
	AM-1120	0.15		2d cleaner non-float	1.2	17.3	8.6
	Gas oil	0.5		3d cleaner non-float	1.7	4.62	3.3
	Pine oil	0.04		Siderite froth	6.2	0.63	1.6
	Cleaners; each:						
	Sodium hydroxide	0.25	11.2	Calculated feed to amine flotation	11.7	14.9	72.4
				Other flotation rejects and middlings (a)	88.3	(0.75)	27.6
				Calculated original ore	100.0	2.41	100.0

(a) Bulk sulphides and products of two soap-flotation steps (no desliming).

floating rhodochrosite from a manganese ore; in floating calcite from magnetite. Calcite was floated from quartz with only fair selectivity.

The pH Is Important

The chief criterion for the amine float of siderite is that the pH be held above 10.9 or 11, preferably below 11.7 or 11.8. In this range, control has not been at all critical. Caustic soda, sodium metasilicate, and mixtures of the two, have provided this pH, the choice having little effect on metallurgy or froth character. Because the pH drops continually during the process, perhaps 0.3 or 0.4 units per 10 minutes of agitation, it was preferable either to start conditioning at high pH (11.5 or 11.6) or add extra alkali during the test. The drop in pH may result from reactions of hydroxyl ion with siderite and oxygen to give magnetite.

Siderite flotation is also better the less the quantity in the ore of foliated silicates such as clay or slimed mica. These minerals must be floated first or otherwise removed. In treating ores like the Colquiri materials, flotation of fine silicates is slow and painful; therefore it proved better to apply the amine process only after desliming or after a prior soap float in which the fine silicates are left behind as rejects. Even very finely ground material then floated well.

Apart from the required alkali, the process seems relatively insensitive to various inorganic reagents, although it was indicated that alkali cyanides, silicates, metaphosphates, or arsenates may at times be helpful. A hydrocarbon oil has been found to improve froth character, but the frother itself (pine oil or B-23) seems to play an essential and unusual role in siderite collection. Frother additions near the middle or end of the float frequently increase froth load as well as froth volume, but the reason for this effect is unknown.

In many tests, good procedure involved conditioning for 3 to 5 minutes with caustic (to pH 11.5 or 11.6), frother, amine, and oil, followed by a 6- to 8-minute float adding frother as needed. Stage addition of reagents works with, and economizes on, amine, but leads to danger of floating cassiterite with excess amine. Froths are heavily mineralized with siderite and otherwise comparable to sulphide froths.

An Hypothesis

We advance the hypothesis that the abstraction of amine by siderite is a form of reversible equilibrium, and that the amine concentration in the water is quite appreciable under the conditions of the operation. For example, a large excess of amine in the rougher floats much or all of the cassiterite with the siderite, but repeated cleaning in new water drops the cassiterite and eventually even tends to drop the siderite. Tailing pulps carry an appreciable amine concentration, as is shown by acidifying a tailing and refloating, with considerable additional bulk of float. Therefore, it is reasonable to expect a saving in amine consumption through re-circulation of mill water.

Amine flotation of siderite has been applied chiefly to the following Colquiri materials:

1. The low-grade gravity concentrate.
2. The non-float from bulk sulphide float.
3. Various soap flotation products following sulphide floats.
4. In combination with soap retreating a low-grade soap concentrate.

Desliming is desirable before 1 or 2, unnecessary for 3 and 4. Table V gives data to illustrate 1, 2, and 3. Case 4 is discussed under soap flotation. It should be noted here that the amine float brings up any sulphide left behind by the first bulk float, thus removing a potential cassiterite contaminant.

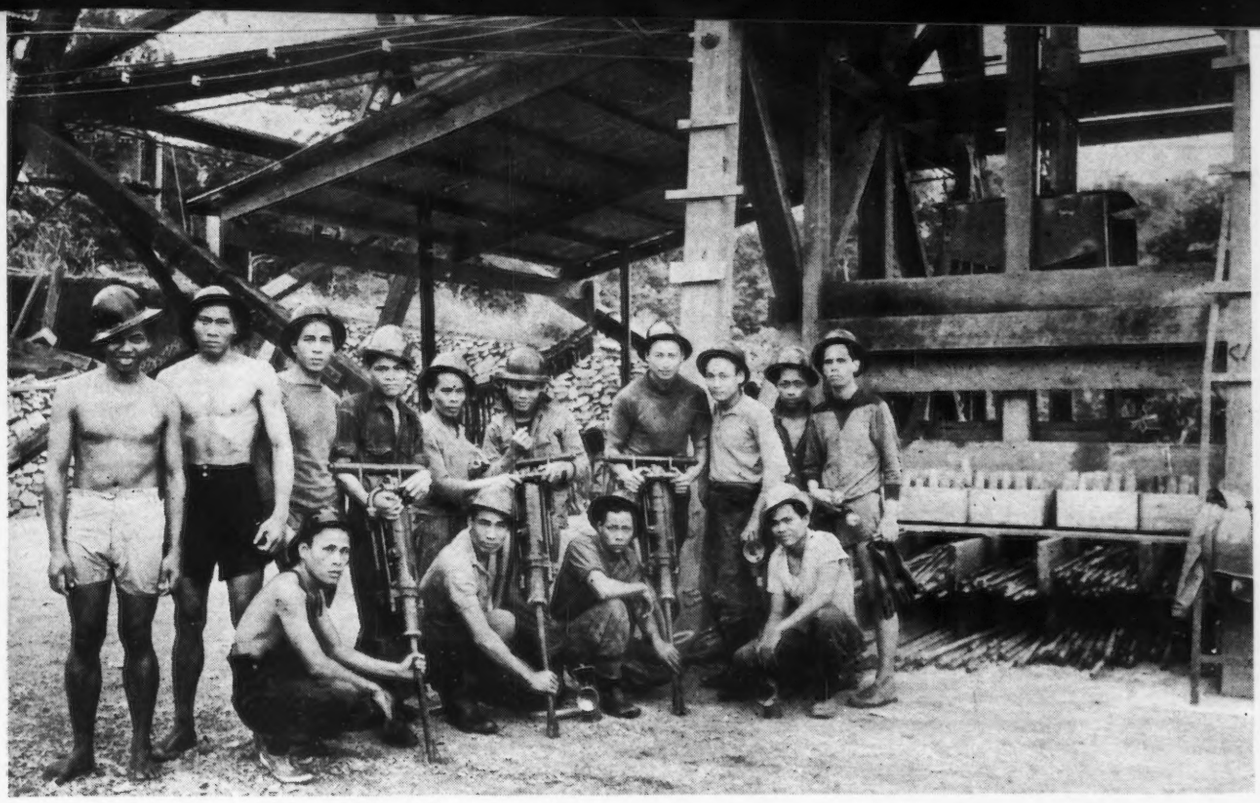
Isolating Cassiterite

Several processes were found[5] for concentrating such mixtures of cassiterite, fluorite, and quartz as the tin products of tests 85, 97, and 314, Table V. Amines in acid pulps, plus modifiers, were used. Fluorite is most floatable, then cassiterite, and quartz is last. Polyvalent inorganic anions (sulphate, sulphite, tartrate) serve as activators; cations (ferric, chromic, etc.) serve as depressors. Concentration of both is high by sulphide flotation standards, but consumption is thought to be small; hence water reuse is once more helpful. Separations have been made in the pH range 2 to 7, and pH control is not critical, but can be helpful. Lower pH favors flotation of both cassiterite and fluorite; higher pH favors cassiterite depression. Froth characteristics are good.

To isolate cassiterite from the mixture requires one of two processes: (1) either fluorite is floated first, then cassiterite; or (2) cassiterite and fluorite are floated together, then fluorite is floated out of this concentrate. Tests indicate that similar conditions serve to float barite or rhodochrosite from cassiterite.

[5] U. S. Patents applied for.

(To be continued)



CREWS LIKE THIS, properly trained in drilling operations and equipped with mucking pans, were able to increase shaft-sinking rates from 31 to 151 ft. per month. These native laborers sunk the Spokane shaft. Both sinkers and drifters were used.

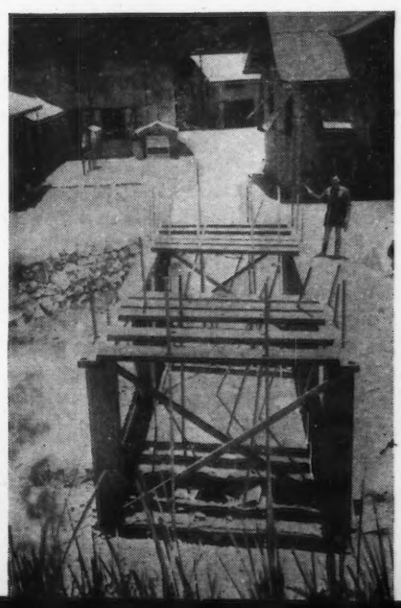
Mucking Pans Speed Up Shaft Sinking

FRITZ N. CARPENTIER, Eureka, Nev. Formerly shaft foreman for San Mauricio Mining Co.

REPLACING CONVENTIONAL shaft-sinking buckets with mucking pans increased monthly sinking speeds from 31 ft. to 118 ft. at the Spokane shaft, and to 151 ft. at the Turayog shaft, prior to Pearl Harbor, at the property of the San Mauricio Mining Co., operated by Marsman & Co. at Mambulao, Camerines Norte, P. I. Faster sinking speeds with trained native labor were also achieved at the San Mauricio, Main, and Santa Anna shafts.

The mechanical mucking pan was originally designed by the late J. S. Finlay, for use in the Tintic district of Utah. The arrangement used at the San Mauricio property is shown in the accompanying illustration.

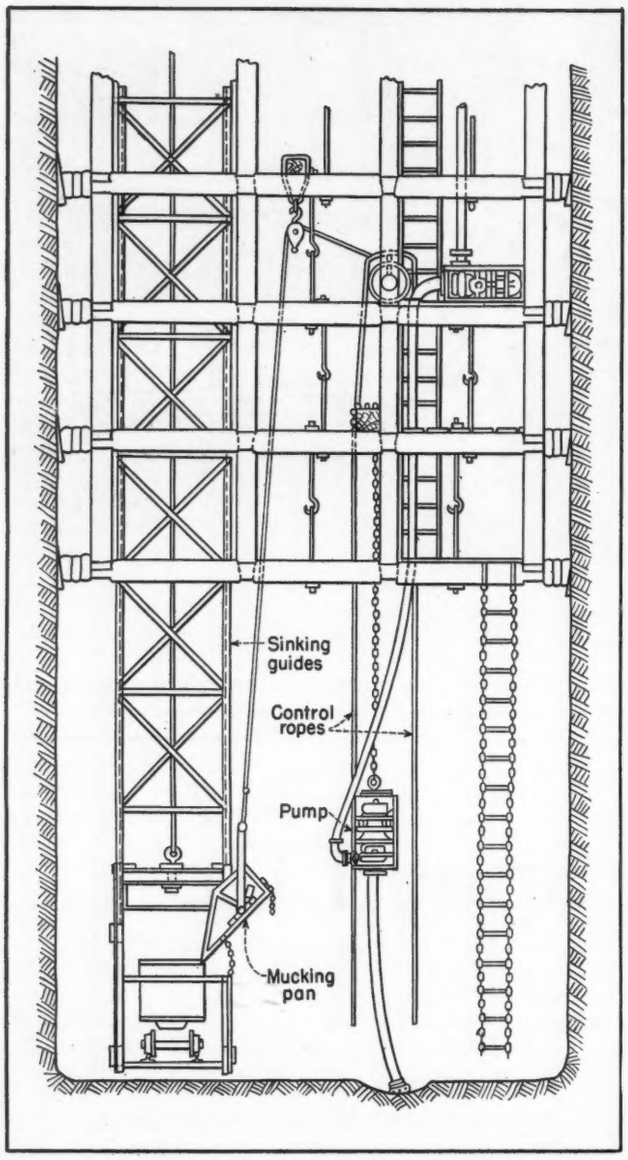
In the Main shaft, sinking was carried on to the 800-ft. mark while from 300 to 400 tons of ore per day were hoisted through it. The manway compartment below the 500 level, the main haulage level, was used as a hoisting compartment, the cage installed therein being operated by a hoist which is located on the 500 level.



NATIVES WERE TRAINED how to drill shaft-round holes properly with this framework, which represents the round at the bottom of the shaft. Top of framework simulates shaft bottom, and loading sticks indicate proper angle at which holes are to be drilled for side V-cut round.

A timber bulkhead was installed in the two hoist compartments about 70 ft. below the 500-level station, with chutes 12 ft. above the bulkhead to draw the spillage into the sinking cage. Two sets, or 12 ft., of cushion were left to protect the men working in the bottom of the shaft in the event of an uncontrolled skip.

Footage made in the first month was 65. The next month this figure rose to 89 ft., in contrast to 30 ft. with the conventional sinking bucket. The work was stopped



How the Mucking Pan Was Operated

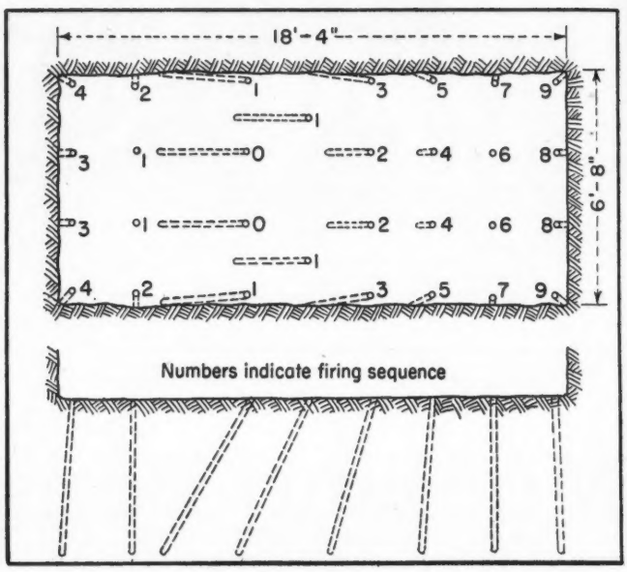
1. Hoisting was done in the end compartment, where long sinking guides permitted lowering the cage below the last set of timber. Safe hoisting was possible with only 12 in. of shoe on the guide. With this equipment, mechanical mucking could proceed when the bottom was as much as 45 ft. below the last set. Normally this interval was maintained at approximately 20 ft.

2. Short guide shoes on one side of the cage provided room for direct dumping of the mucking pan, which was filled by hand mucking. Pan measurements were: length, 53 in.; width, 2 ft. 6 in.; height, 2 ft.

3. A stationary air hoist mounted approximately 125 ft. above shaft bottom was controlled by two ropes to raise and lower the pan.

4. To unload, the pan was raised, and pushed into the cage. A short chain attached to the pan was then hooked to the cage, and the pan was raised into dumping position. The short chain at the back of the pan was provided for steering purposes.

5. Five-horsepower centrifugal pumps at 100-ft. intervals were connected in series to remove water during mucking. Lowest pump was suspended from chain, and raised before each blast.



Thirty-Hole V-Cut Shaft Round

DRILLING EQUIPMENT: Three drifters fitted with handle bars and chucks for 1½-in. round steel; 4 55-lb. sinkers with chucks for ⅞-in. hexagonal steel; 3 55-lb. mollers. Bit diameters vary by ⅛-in. increment; steel lengths vary by 1-ft. increment.

PROCEDURE: Cut and relief holes were drilled 7½ to 8 ft. deep with drifters to provide larger holes for heavier powder charges. Remaining holes were drilled with sinkers to 6-ft. depth. Air-operated hoist was used to pull stuck steels if necessary. Holes were loaded, and primers connected to two blasting wires strung lengthwise along the bottom of the shaft. Two primers were used in the corner holes to prevent misfires. Round was blasted from the surface. Mollers were used to trim any minor rock projections remaining after the round was mucked out.

POWDER CONSUMPTION: 24 8-oz. sticks of 60 percent gelatine dynamite per foot of round.

when sinking operations reached the 800-ft. mark.

Next, the Spokane shaft was sunk through serpentine occurring from the surface to a depth of 135 ft., below which lay a hard granite gneiss. Here a monthly footage of 118 ft. was achieved in the granite from the 195-ft. mark to 313 ft. The serpentine section required heavy timbering. Necessity of keeping timber as close as possible to the bottom of the shaft called for use of 3-ft. sets. All timbering was done by the sinking crew consisting of one capataz (foreman), 10 shaft men, three compressor operators, and one pump man per shift. Sinking results at the Spokane shaft during December are given in Table I. Sinking conditions at the Turayog shaft differed little from those encountered in the Spokane shaft. Table II gives results attained.

The 30-hole, side-cut shaft round which is shown here, minimized timber breakage, and piled the broken muck at one end of the shaft—a great help in pan mucking.

Air was supplied from a 4-in. pipe through a main air valve and 50 ft. of 3-in. hose to a manifold

designed to feed 10 50-ft. hoses. This manifold was disconnected and removed during blasting. A 2-in. pipe was then connected to the main air valve and pointed up the shaft. This was opened after each blast, and powder fumes were removed speedily. Generally men could return to the working place in about 20 min.

Water for drilling was obtained from a water ring installed on the granite contact fed by water seeping from the serpentine section above. An eight-machine water manifold was connected to the 2-in. pipeline extending down the shaft to the bottom of the water ring. After each blast, the 2-in. valve below the water ring was closed and the ring contents were allowed to overflow at various points, forming a spray which killed the gases in the muck pile. By the time the round was ready to blast, the water level generally rose to about 3 ft. and acted as a cushion during blasting. This reduced damage to timber and destroyed the gases in the muck pile after blasting.

Fast handling of materials speeded up sinking operations. Steel was transported in the shaft by a cage constructed to facilitate easy loading and unloading, with the attendant riding on top. Each piece of steel was carefully inspected before being lowered to the bottom of the shaft. Framed timber for delivery underground was handled by a small auxiliary air hoist installed in the headframe. Usually a complete shaft set was sent underground, with the wall plates on top of the cage, and posts and dividers were loaded onto the cage.

Underground, the wall plates were removed from the top of the cage by the air hoist normally operating the mucking pan. A clevis was first attached to a hole in the center of the wall plate. The hoist cable was then secured to the clevis, and the top end of the wall plate was tied to the hoist cable by a short rope. Thereafter the wall plate was lowered to the ground in a vertical position. Here, the tie rope was removed and the wall plate allowed to come to rest in a horizontal position. It was subsequently hoisted into place, with the timber man riding the plate balancing it for installation of the hanging rods. End plates, posts, and dividers followed.

The set was held in place by an 8x8-in. timber placed under the wall plates and held by the air hoist. After hanging rods had been tightened another shaft set was lowered and installed. Four complete sets were placed during the timbering period by the shaft crew. As soon as these had been placed, the men completed blocking the dividers. The regular shaft crew installed as much as four sets of guides and pipes during an 8-hr. shift, and one set in an hour when blocking was easy.

Relatively little overbreak occurred in blasting operations, and secondary breaking was seldom required. If a place was tight for timbers, it was plugged and blasted with the regular shaft round. Minor obstructions were removed with moilers. These units were also used to advantage in mucking operations, because the natives did not care to work with hammer or pick. Boulders were dumped on top of the car in the cage either by the mucking pan or by cable and hoist, depending on the size of the rock fragment. The crew sent as high as 85 cars (19 cu. ft.) of broken waste to the dumps on the surface during an 8-hr. shift.

The proper treatment and training of native labor paid good dividends. The natives came from different regions of the Islands, and spoke various dialects. As a rule, every effort was made to make up each shaft crew from men speaking the same dialect. The greatest difficulty was to get the men to drill holes at proper angles and use more steel on each change. Invariably they would continue to drill until the bit was completely worn, making it almost impossible to continue with the next drill change. Although the men collared the holes without much difficulty, they could not understand the angle of inclination of the hole. The difficulty was overcome by building a platform on the surface identical in size as the shaft, and 6 ft. high. Holes representing the typical shaft round were drilled into the floor, and into them were placed tamping sticks to explain where the holes should bottom. The men were given an hour of schooling each shift for a week. Thereafter faulty inclination on holes was eliminated.

Payment of a bonus also improved matters. It was based on three shifts per day, as follows:

		Centavos Per Foot
	Miners,	20
Above 1.3 ft. but less than 1.6 ft., per day..	Capataz	30
	Miners	30
Above 1.6 ft. but less than 2 ft. per day..	Capataz	40
	Miners	40
Above 2 ft per day..	Capataz	50

The shaft men in general were paid a bonus of 1.37 pesos per day, and the capataz, 1.71 pesos per day. Hoistmen, compressor men, and electricians were paid a flat bonus of 15 pesos per month only.

Under existing climatic conditions the stamina of the men was remarkable and their work compared favorably with that of the average miner elsewhere. Once properly trained, they were reliable and trustworthy. The accident record was exceptionally low.

In conclusion, I wish to pay tribute to the late Harry Barr, general manager, who lost his life on an Army contract after Pearl Harbor, and to Thomas White, mine superintendent, for their help in introducing the mucking pan system into Philippine mining.

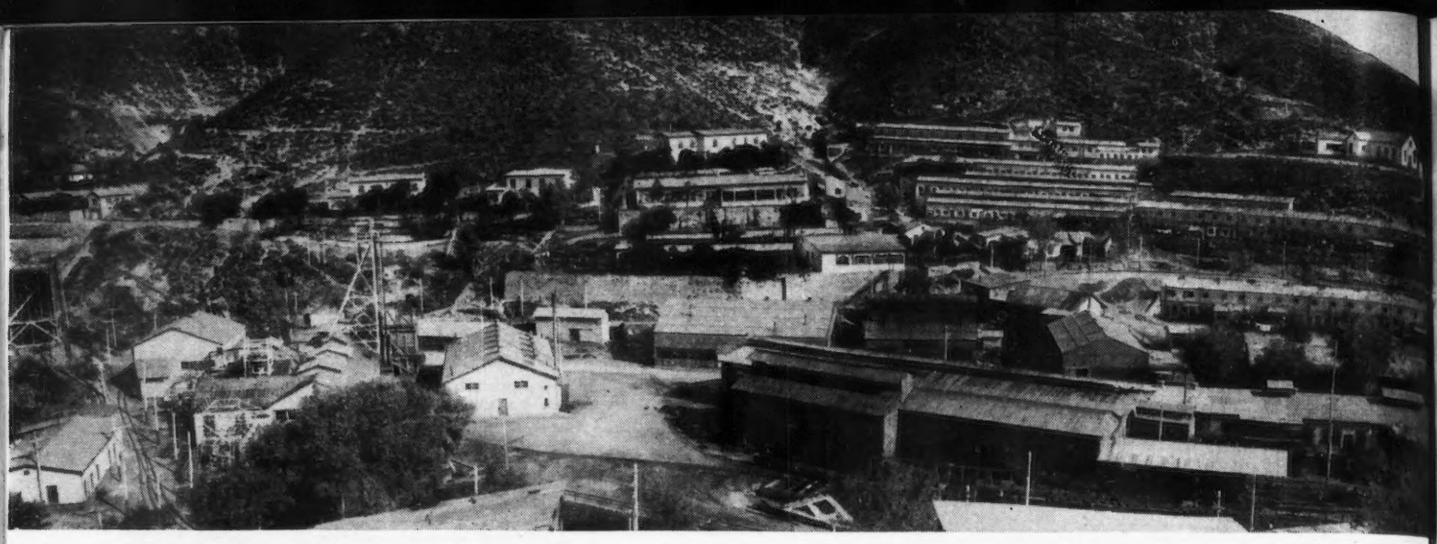
Table I—Spokane Shaft Data for December 1939

MISCELLANEOUS	
No. of 8-hr. shifts worked	93
Man-shifts	1,360
Total advance	118 ft.
Number of rounds blasted	21
Sets of timber placed	18
Total lost time (*a*)	96 hr.
Average blasting cycle	35 hr.
Advance per round blasted	5.6 ft.
Drill steel used per round	246 bits
COST PER FOOT IN PESOS	
Labor (including bonus)	36.59
Explosives	6.57
Timber	9.91
Other supplies	4.32
Supervision (capatazes)	1.48
Mine distributive (staff supervision, machine drills, etc.)	7.71
Power	1.83
Engineering	0.41
Total cost per foot	68.82

(*a*) The lost hours were mostly due to cable and power trouble.

Table II—Turayog Shaft Data for November 1940

MISCELLANEOUS	
No. of 8-hr. shifts worked	90
Man-shifts	1,082
Total advance	151 ft.
Number of rounds blasted	28
Sets of timber placed	22
Average blasting cycle	24 hr.
Advance per round blasted	5.43 ft.
Drill steel used per round	350
COST PER FOOT IN PESOS	
Labor (including bonus)	19.69
Explosives	4.54
Timber	9.91
Other supplies	4.32
Mine distributive (staff supervision, machine drills, etc.)	10.50
Power	1.83
Engineering	.41
Total cost per foot	51.20



SURFACE INSTALLATIONS AT EL POTOSI MINE. Main hoisting shaft is beyond church, upper right. Compressor house, shops, and No. 5 shaft (auxiliary) in foreground. Residential quarters are shown in the upper center of the view here presented.

Vistas of Mexican Mining—III

Howe Sound Pioneers in Sierra Madre

EVAN JUST, Editor

This enterprising company may be first to break the tradition that the early Spaniards found all the good mines

THE FAMOUS MINE of the Howe Sound affiliate, El Potosi Mining Co., is still operating, but on a reduced scale. Only a few years ago[1] this mine, with its interesting large chimney-manto orebodies—one of these massive sulphide replacements of limestone was 2,000 ft. in length—was the largest lead-zinc producer in Mexico.

There is always a possibility that further exploration of a property like this may discover new orebodies. The property is being rather thoroughly drilled, with the result that many small orebodies are being discovered and mined.

As it was not willing simply to "die on the vine," in 1941 the Potosi organization started an exploration program in the name of a subsidiary, Minerales de Chihuahua, S. A. As a result, a new property is now being developed, El Carmen, on the Batopilas River, in the heart of the rugged Sierra Madre directly west of Parral. If this property turns out to be an important mine, it will be the first to break the tradition that the Spaniards and their predecessors found all of Mexico's gold mines.

Although the deposit is primarily a copper-gold orebody (chalcopyrite), it is only 20 km. from the Batopilas district, an old silver camp dating back to Spanish days. The vein is 1½ to 3½ percent and ranges up to 10 percent. The gold content, which is erratically distributed, averages 8 to 12 grams per ton. The vein has little gangue, mainly chlorite and quartz. Near the top, under a rhyolite flow, the orebody carries galena, sphalerite, and a high silver content. The wall rock is andesite, with some porphyry intrusions, all Tertiary.

The company is building a road to the property, some 112 km. south from Creel, the railhead. To aid this expensive undertaking, the Federal Government has agreed to waive all production and *aforo* taxation until $700,000 (U. S.) has been deducted. This is the estimated cost of the road.

The company is also planning a 400-ton diesel-powered flotation and cyanide plant.

MINA VIEJA HEADFRAME and transfer station on tramway.

[1] A. H. Hubbell: "El Potosi—Premier Producer of Lead," E.&M. J., March 1936, p. 119.

A.S.&R.'s Modern Operation at Santa Eulalia

In this district, famous for its interesting large chimney-manto orebodies, A.S.&R., now mining base-metal sulphides, has completely modernized its operations.

THE PRESENT PHASE of American Smelting & Refining Co. operations at Santa Eulalia, featuring the mining of massive chimney and manto zinc-lead sulphide milling ores, began in 1940. The mining operations, which straddle a mountain range replete with eye-filling views, deliver their output over the divides and down the slope to Santa Eulalia by aerial tram. From a transfer station there, the ores are hauled by railroad 12 km. to the mill, which adjoins the large A.S.&R. lead smelter outside the city of Chihuahua.

Up to 1929, the A.S.&R. mines of this district had produced only direct-shipping ores, principally from the Mina Vieja, Dolores, Sin Nombre, Santo Domingo, Velardeña, and San Antonio mines. All of these were primarily silver-lead producers.

In the late twenties, plans were made to recover the tin in the San Antonio ore. To recover this tin, the beginning of the present mill was built in 1929 to separate tin and lead carbonate concentrates. The tin-lead carbonate-silver ore was in a chimney which proved to be 1,800 ft. high. Commercial tin values played out in 1939. During 1937-39 the mill was modified to recover vanadium from the San Antonio ores. When the carbonate milling ceased, the mill was remodeled to treat sulphide ores, such as the Santo Domingo orebody. The Buena Tierra shaft was reconditioned and deepened, and the surface site was built up into a modern shop and management headquarters.

At present the principal tonnage is produced from the Santo Domingo mine. This mine, now 2,500 ft. deep, produced from chimney-manto orebodies, the largest being 200 ft. high and 150 ft in diameter, with several *mantos* (horizontal or inclined ore runs tributary to the chimney), one 40 ft. thick, another 30 ft. thick. The ore carries silver, lead, zinc, and iron.

The San Antonio Unique

The other chimney-manto mine is the San Antonio, 5 miles east of the Santo Domingo on the opposite slope of the range. This property, now 1,600 ft. deep, is unique in the district for producing non-marmatitic zinc ore.

The Velardeña mine produces direct-shipping silver-lead carbonate ores.

Mina Vieja now produces smelter flux, limestone, and silver-bearing siliceous ore.

The Reina de la Plata is only a small producer. It is unique in the district for its gold values.

Geologically the district is interesting because of the massive chimney-manto replacement orebodies. These range up to 1,500 ft. in height and 150 ft. in diameter, exclusive of the mantos which branch out from them.

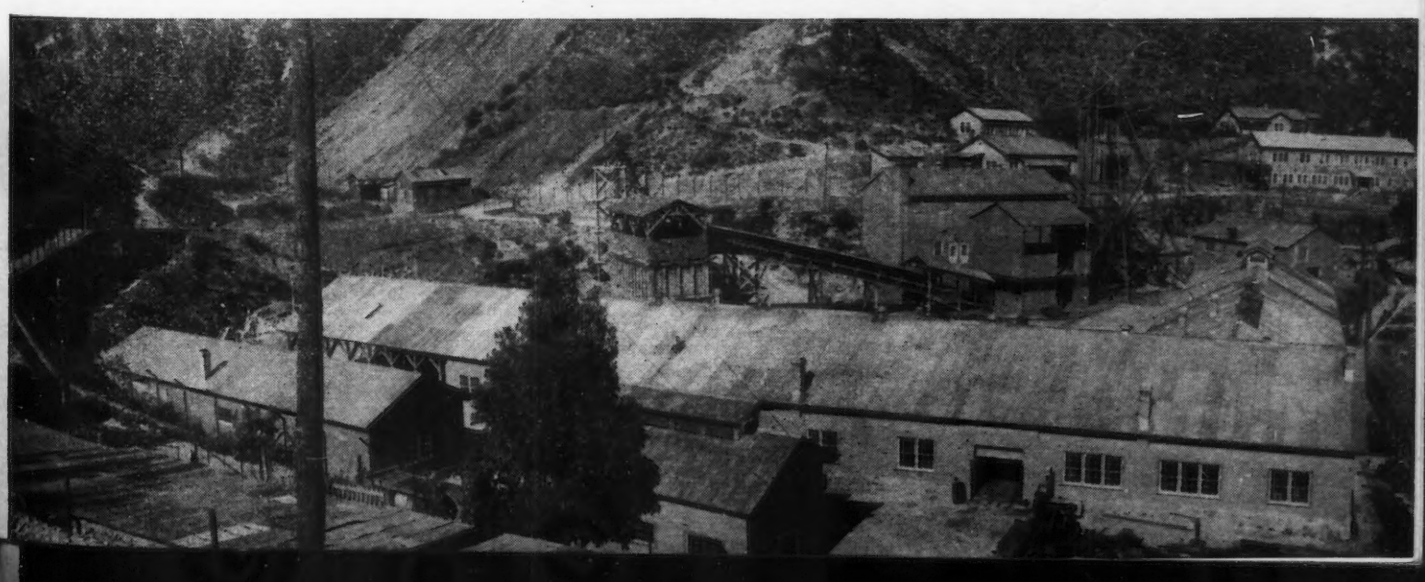
The chimneys and mantos seem to favor certain north-south fractures, which are persistent but commonly inconspicuous. Also, at lower levels, mantos often lie along the upper or lower sides of sills, particularly where there are flexures in the sills. Presumably the sills ponded or channeled the mineral-bearing fluids. The selectiveness of the mineralization, so commonly observed in limestone replacements, is evinced by occasional beds and sills which tend to remain unreplaced within the boundaries of the orebodies.

The principal minerals of the chimney-manto sulphide orebodies are marmatite, galena, pyrrhotite, marcasite, sphalerite, calcite, and quartz.

The orebodies occur in a Cretaceous limestone section 2,500 to 3,000 ft. thick. Orebodies occur throughout this section. In places, on top of the limestone, which is more or less horizontal, is a capping of Tertiary rhyolite flows and agglomerates. The area is also cut by rhyolite dikes and rhyolite and diorite sills. The area is also cut by a major north-south fault (Donnell fault) on the west; however, it is not apparent that this fault has any connection with the mineralization.

The method of mining the chimneys and mantos is interesting, cheap, and simple. The chimneys are outlined by diamond drilling before development. A manway raise along the side wall of the chimney and an ore raise through the center of the chimney are driven from the first haulage level below the top of the orebody to the haulage level above. These are connected by a drift at the top of the orebody from which the top of the orebody is silled out. The orebody

SURFACE PLANT at Buena Tierra mine.



is then glory-holed, the mantos being breast-stoped when the stope floor reaches their level. When the lower haulage level is reached in stoping, the manway and central ore raise are extended to the next level below and glory-holing proceeds. The intermediate haulageways are supported by pillars until the chimney is bottomed. Sometimes where the chimney is very large, the roof is also supported by pillars. All pillars are ultimately recovered. Scraping is commonly used in the bottoms of the stopes when the chimneys are being bottomed. Scrapers are also used in the mantos, ore being scraped as far as 40 meters to grizzlies in the floors of the manto stopes. Below the grizzlies are ore raises leading to the haulage level below.

Exploration is done by diamond drilling and by drifting. The average round consists of 18 holes for 5x7-ft. raises and drifts, and 21 holes for 5x9-ft. winzes. Rounds are drilled 4 ft. deep and pull an average of 1 meter per shift. In drifts V-cuts are used. Burn cuts are used in raises, winzes, and shafts.

About 800 men are employed in mines, mill, and transportation system. Three hundred of these are underground workers. The mill operates three shifts. The larger mines are also on three shifts, but the third shift is mainly for tramming and hoisting. Most development work and ore breaking are done on contract, with a guaranteed minimum. Contract workers average 40 to 50 percent more than the base wage. The change in wages in recent years is indicated by the increase in the wage for peons (common labor). In 1934 they got 1.75 pesos. Now they get 7 pesos.

At the Buena Tierra

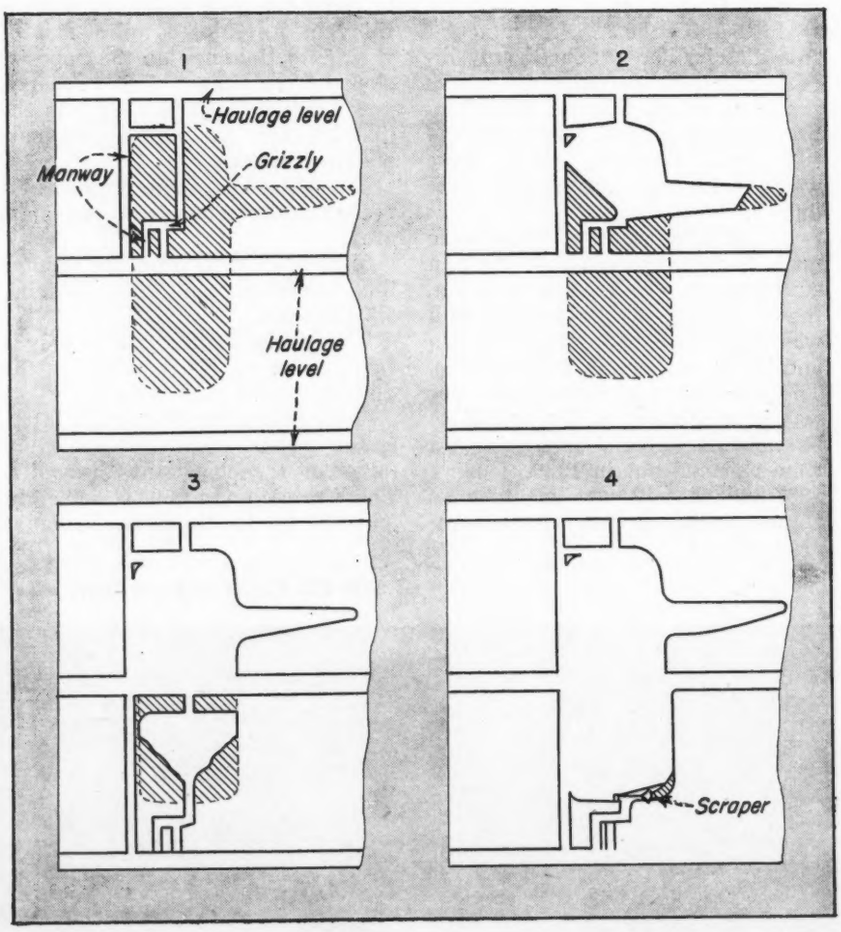
The Buena Tierra mine, when acquired, had a two-compartment timbered shaft to the 14th level (1,400 ft.), which is the top of the sulphide zone. This portion of the shaft is unchanged. Below the 14th level, the shaft is three-compartment, with steel sets. All the steel sets and hangers are H-beams. Levels below the 14th are 50 meters apart, the present bottom being the 20th level (2,500 ft.). All shaft compartments are 4½ ft. square, in the clear. Hoisting is done in 3-ton skips, which dump into a 25-ton hopper. This hopper, equipped with a Ross chain feeder, feeds the ore and waste to a gyratory, which discharges by a belt conveyor and shuttle conveyor to a 300-ton ore bin and 100-ton waste bin. These bins have eight chutes for loading the ½-ton tramway buckets. The waste is delivered either to the smelter or is used as railway ballast.

The surface facilities at the Buena Tierra shaft are all in new modern buildings. They include a change house with automatic water heating, a lunch room with electric stoves and tables folding to wall (also used for safety meetings), a safety equipment store room, machine shop, foundry, welding shop, carpenter shop, personnel office, paymaster office, mine supervisors' office, and general office.

Because of its isolated location, the San Antonio mine has a separate community attached to it. This mine, 1,600 ft. deep, has a four-compartment shaft, accommodating balanced 2-ton skips, a cage, and a manway-service shaft. This is the only mine in the group which has water. Pumpage is 150 gpm. Of this, 20 gpm is chlorinated, softened, and pumped over the mountain to the main colony in a 20,000 ft. 2½- and 2-in. pipeline.

None of the mines requires forced ventilation. The San Antonio has an air shaft, brattices, and doors. All the others are interconnected. The mines are generally comfortable, but temperature gets as high as 90 deg. F. in some dead ends. Because the ores average less than 5 percent silica, no silicosis hazard exists. Power for the mines and mill is purchased from the local utility, Cia. Agricola y Electrica del Rio Conchos.

The mill operates with two feeds, which are kept separate throughout. The San Antonio ore and ore from the Plomosa mine, another A.S.&R. operation in Chihauhau, being non-marmatitic, are not mixed with the Santo Domingo ores. Total mill capacity is 1,000 tons per day. The present products made are lead and zinc concentrate.



FOUR STAGES of the mining method which is employed in stoping pipe and manto orebodies at Santa Eulalia, in Chihuahua.

In the first article of this series, E.&M.J., Sept., p. 75, the statement that the Fresnillo Co. mines 200 tons per day should have read 2,000 tons per day.

Engineering Staff Calculates Expected Survey Accuracy

C. J. BARBER, Superintendent, Mining Engineering Department, Cia. de Real del Monte y Pachuca, Pachuca, Hidalgo, Mexico

THE SURVEYS DESCRIBED HEREIN were made by Compañia de Real del Monte y Pachuca to connect the new Parícutin shaft with workings from the Tula shaft. The Parícutin vein had been cut on the 370-m. level, the water table, 1,700 m. from the Tula shaft. As a heavy flow of hot water at 135 deg. F. prohibited drifting on the 370, the vein was developed on the 345 level, driven from the footwall raises Zero and 5 N. Because the only access was through Tula and the 370, Parícutin shaft, 1,300 m. southeast of Tula, was sunk from surface for ventilation and service.

It was originally expected to connect by raising from the 345 level, preferably by raising vertically under Parícutin shaft. As work progressed, an earlier connection became possible on the 305 level, driven from the same footwall raises. Accordingly, a crosscut from the shaft on the 305 level connected to a crosscut from the vein; the shaft was then sunk to connect with a crosscut on the 345 level.

Tula shaft was strongly downcast; about 30,000 cu. ft. of air per minute was pulled north on the 370 by a high-speed surface fan at another shaft. Two additional fans at the Tula shaft, aided by seven auxiliaries, diverted 4,000 c.f.m. each southward through two 18-in. pipes to the Parícutin workings. Air temperatures during the surveys averaged 103 deg., 111 deg., and 115 deg. F. on the 370, 345, and 305 levels respectively.

To make the connection by raising vertically under the Parícutin shaft, it was important that the error of location should not exceed ±0.5 m. along a line connecting the Tula and Parícutin shafts, nor ±1.3 m. normal to that line. Calculation, as described later, showed that the error to be expected at the end of the traverse was within these limits, and eliminated the consideration of a more expensive connection. Calculated average errors, or errors to be expected at the end of the traverse, and the differences found after the connection, are shown in the accompanying table (at bottom of page).

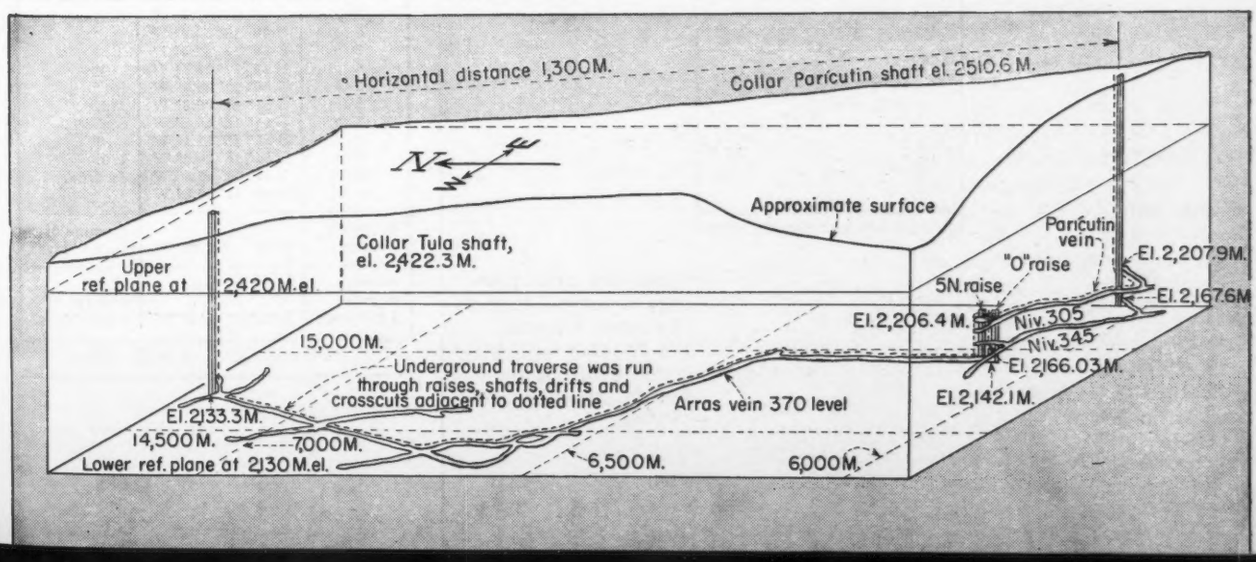
Surface positions of the Tula and Parícutin shafts were tied in with a precise triangulation network on the property. Three independent levels were run between stations near both shaft collars; average variation from mean was 1.7 mm. Elevations were then transferred to the shafts from the nearby stations. Two levels which were run underground on the 370 level differed by 5 cm. In both surface and underground levelings, backsight and foresight were made approximately equal in length, and rod levels were used to hold the rod vertical.

Horizontal and vertical distances were measured with a Lufkin 100-m. steel tape, ½ in. wide, which was checked against a standard tape, certified by the National Bureau of Standards, Washington, D. C. The tension giving the correct measure-

Comparison of Calculated Expected Error and Actual Differences

	Calculated Average Error	Actual Difference
Average error in location, normal to the line Tula-Paricutin	± 0.583 meters	+ 0.523 meters
Average error in location, along the line Tula-Paricutin....	± 0.298 "	− 0.247 "
Average error in elevation.....	± 0.060 "	− 0.001 "
Average error in bearing of the line Tula-Paricutin.....	± 1′ 30″	− 1′ 22.7″
Average error in bearing of last traverse line.....	± 2′ 42″	− 1′ 50″

IN ORDER TO ATTEMPT a mine connection by raising up under the Paricutin shaft, the expected error of the survey had to be calculated within close limits. The procedure and results of such an undertaking are described in this article.



ment was determined, and used for all horizontal distances, thereby eliminating any tension correction.

The correct tension for vertical distances was calculated from the manufacturer's formula, $T_v = T_f - \frac{W}{2}$

where

T_v = Correct tension, tape hanging vertically.
T_f = Correct tension, tape supported on flat horizontal surface.
W = Weight of tape.

In effect, the tape became a long leveling rod to carry elevations down the shaft; both ends were read with a level by engineers, who then leveled to permanent bench marks. A short scale, held against the nearest tape graduation, gave readings to the nearest 0.5 mm. Three observations were made, the tape being moved slightly between readings.

Using both verniers of a 20-sec. Watt transit, two engineers measured the angles of the underground traverse independently by repetition, taking two readings with the telescope normal and two with it reversed; the explement was read in the same way. If the sum differed from 360 deg. by more than 25 sec., the angle, and, if necessary, the explement, were repeated.

The angles and explements, read by both men, were tabulated independently. If the two averages differed by more than 20 sec., both angle and explement were repeated by one man, and by the other if the third result differed from the preceding two. Neither man knew the other's angle until later. All results were averaged, excluding occasional obvious blunders.

To check against possible constant personal errors, each engineer's angles were added; the average difference for the 370 level was 0.7 sec. per angle.

In the worst sections a man could measure only one angle and explement in a day, and work underground only on alternate days. Troublesome air currents necessitated shielding all plumb bobs. The 37 set-ups on the 370 level required seven weeks' field work.

Taping the Traverse

Two engineers taped the traverse with the 100-m. tape previously described. The tape was supported by light rectangular sticks, resting on the track about five meters apart. When the track was uneven, the supports were raised to a uniform grade, determined by leveling. Both tape ends were read simultaneously at the points of mercury plumb bobs, hung just off the floor and shielded from air currents. Correct tension was applied, and the air temperature read from a thermometer suspended near the middle of the tape. Difference in level between ends of the tape was determined by leveling.

Each line was measured three times, the tape being moved slightly between readings; the engineers then changed places and took three more readings, repeating the work if the range of difference exceeded 3 mm.

The manufacturer gave the tape's coefficient of expansion as 0.000,006,45 per degree F. above 68 deg. F. The correction totaled 0.424 m. for the 2-km. traverse on the 370 and 305 levels.

Distances were reduced to the horizontal by the following formula[1] for grades less than 5 percent, $C = -\frac{h^2}{2S}$

where C = correction to slope distance.
h = difference in elevation between tape ends.
S = slope distance.

Horizontal distances were then reduced to elevation of the company's datum by the formula[1],

$$C = -\frac{Sh}{R}$$

where C = correction to horizontal distance.
S = horizontal distance.
h = height above datum.
R = radius of the earth, taken as 6,378,206 m.

The traverse being below the datum, the correction, which totaled 0.075 m., was added.

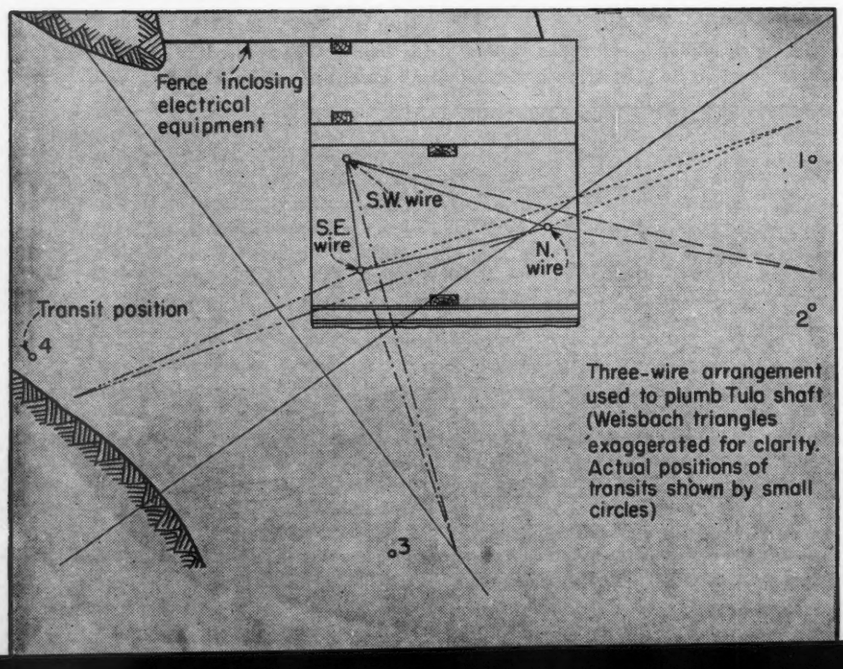
The 370 level was oriented from the surface triangulation by plumbing the Tula shaft nine times from surface and twice from the 270 level. See accompanying table.

Moving wires, caused by air currents, were troublesome. The first two plumbings were made with all the fans running, the remainder with the large surface fan and the two station fans stopped; while a ventilation door, just north of the 370 station, was closed.

Erratic results of the first five plumbings necessitated a final plumbing from surface, and another from the 270 level. Here a careful survey had been made ten years ago, when the Tula shaft was connected by raising and sinking. Three wires were hung from the

[1] Manual of First Order Traverses, Special Publication #137, U. S. Coast and Geodetic Survey.

THREE WIRES were hung from the surface while plumbing the Tula shaft so that four alignments could be made as shown. The Weisbach angle never exceeded one minute. The Weisbach method is used when conditions prevent wires from coming to complete rest. See Mining Engineers' Handbook, by Robert A. Peele.



Three-wire arrangement used to plumb Tula shaft (Weisbach triangles exaggerated for clarity. Actual positions of transits shown by small circles)

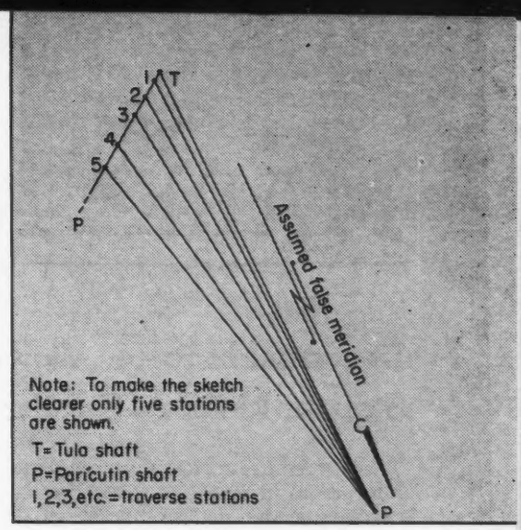
Summary of Plumbings in Tula Shaft

Case	Calculated Bearing Base 613 to Base 614 370 Level	Shaft Plumbed From
1 (*a*)	S 35° 23′ 17.9″ W	Surface.
2 (*b*)	S 35° 19′ 52.3″ W	"
3 (*b*)	S 35° 18′ 07.5″ W	"
4 (*b*)	S 35° 17′ 35.5″ W	"
5 (*b*)	S 35° 17′ 27.6″ W	"
6 (*b*)	S 35° 17′ 00.3″ W	270.
7 (*b*)	S 35° 16′ 45.2″ W	Surface.
8 (*b*)	S 35° 16′ 11.1″ W	"
9 (*b*)	S 35° 15′ 30.3″ W	270.
10 (*b*)	S 35° 14′ 49.6″ W	Surface.
11 (*b*)	S 35° 13′ 29.8″ W	"
Accepted Bearing....	S 35° 17′ 17.0″ W	Average of 11 plumbings.
Average of cases 3 to 8 incl..	S 35° 17′ 11.2″ W	Average of 6 plumbings.

(*a*) Fans running. (*b*) Fans stopped.

Assumed and Calculated Error Compared With Actual Difference

Case	Assumed Average Error in				Calculated Average Error	
	Orientation of 370	Orientation of 305	Each Traverse Angle	Each Distance, Meters	Normal to TP, Meters	Along TP, Meters
1	± 40″	± 60″	± 20″	± 0.003	± 0.583	± 0.298
2	± 40″	± 60″	± 15″	± 0.003	± 0.476	± 0.263
3	± 10″	± 40″	± 20″	± 0.003	± 0.519	± 0.243
4	± 10″	± 40″	± 15″	± 0.001	± 0.394	± 0.198
5	± 40″	± 60″	± 20″	± 0.001	± 0.583	± 0.297
Actual difference					+ 0.523	− 0.247



METHOD OF CALCULATING average error of the survey is indicated in this sketch. See text for details of method.

surface so four alignments could be made, one with each pair; in one case alignment from the opposite side of the shaft was possible. See sketch showing wire positions. Although a direct tie between surface and the 370 level was preferred to relying entirely on the 270-level survey, two plumbings were made from the 270 level.

Swinging wires made exact alignment underground almost impossible, so the quicker and more accurate Weisbach triangle was used; the Weisbach angle never exceeded one minute.

All the plumbings were averaged, although the range was 10 min. However, six plumbings, whose average differed from the accepted bearing by but 5.8 sec., varied only 2 min.

The 345 level was first oriented by plumbing the Zero raise with two wires, only 0.85 m. apart. This was checked twice with one wire in the Zero and one in the 5 N. orepass, about ten meters away. The triangle between the wires and transit was solved by the formula for the law of cosines $c^2 = a^2 + b^2 - 2ab \cos C$, followed by the sine formula. Results of three plumbings had a range of 30 sec.

To orient the 305 level, the same two raises were plumbed from the 345 level, with one wire in each raise. It was impossible to drop both wires to the 370 level. Two plumbings differed by only two seconds.

The average error at the end of the traverse was calculated by a method described in "Surveying Calculations," by F. Winniberg (Mining Publications, Ltd., London) pages 127 to 130. After careful consideration the following assumptions were made:

Average error in orientation of 370 level at Tula shaft ± 40 sec.
Average error in orientation of 305 level at Zero raise ± 60 sec.
Average error in each traverse angle ± 20 sec.
Average error in measuring each distance ± 0.003m.

These assumptions were intended to be liberal because the effect of air currents was uncertain.

The survey was plotted to a scale of 1:2,000; stations beyond the face were located by estimation. This approximation, being near the end of the survey, made little difference to the results.

In the accompanying figure, *T* is the wire in Tula shaft and *P* the center of Parícutin shaft; 1, 2, 3, etc., are the traverse stations. The points *T*, 1, 2, 3, etc., were connected to *P* and the length of these lines was scaled. The line *TP* being taken as false meridian, the angles *PT*1, *TP*1, *TP*2, *TP*3, etc., were scaled to the nearest degree, and in the calculation which follows, are taken as the bearing of the lines *T*1, 1*P*, 2*P*, 3*P*, etc. The quadrant bearings of the lines 1-2, 2-3, etc., were also scaled, taking *TP* as meridian.

If E = average error in each measurement (i.e. ± 0.003 m.)
E_1 = average error in bearing of $T1$ (i.e. ± 40 sec.)
E_2 = average error in each traverse angle (i.e. ± 20 sec.)

And if 1, 2, 3, 4, N, are assumed quadrant bearings of the lines *T*1, 1-2, 2-3, etc., assuming also *N* traverse stations (in this survey N = 53), then it can be shown that the average errors in departure and latitude of *P* referred to *T* is expressed in the accompanying formulas.

$$\text{Average error in departure} = \pm \sqrt{E^2(\sin^2 1 + \sin^2 2 + \sin^2 3 \cdots \sin^2 N) + E_1^2[(PT)^2\cos^2 O] + E_2^2[(1P)^2\cos^2 TP1 + (2P)^2\cos^2 TP2 \cdots + (NP)^2\cos^2 TPN]}$$

$$\text{Average error in latitude} = \pm \sqrt{E^2(\cos^2 1 + \cos^2 2 + \cos^2 3 \cdots \cos^2 N) + E_1^2[(PT)^2\sin^2 O] + E_2^2[(1P)^2\sin^2 TP1 + (2P)^2\sin^2 TP2 \cdots + (NP)^2\sin^2 TPN]}$$

Equations Modified

The accompanying equations were modified to allow for the increased error in orientation on the 305 level, due to plumbing from the 345 and 370 levels. These equations can be simplified to give the average error in position of *P* referred to *T*, but more information was obtained by solving them independently, with the results given previously.

See table of assumed and calculated average error as compared with actual difference.

Case 1 contains the original assumptions; case 3 comes closest to the differences actually found; case 4 indicates what might have been expected under favorable conditions; and case 5 shows the negligible effect of reducing linear errors.

Although not the same as the real error, the average error gives a reliable criterion to judge the degree of precision attained in the various measurements.[2]

This caluculation had definite economic value because it showed that the connection could be made by raising vertically under the shaft, had the need arisen. The other average errors shown were calculated as a matter of interest.

(*Continued on page* 140)

[2] "Metalliferous Mine Surveying." By F. Winniberg, page 25. 1st Edition. Mining Publications, Ltd., London.

MARKETS—Trends and Prices

Decontrol of Prices Viewed as Constructive Step for Metals—Copper Advanced to 19½c.

THOUGH THE ELECTION RETURNS were interpreted in market circles as foreshadowing the demise at an early date of most wartime controls, the action taken by President Truman on Nov. 9, decontrolling prices on all commodities excepting sugar and rice, was an unexpected but welcome development. Non-ferrous metals responded immedately to the good news, and prices for copper, lead, zinc, tin, and antimony moved upward to the levels obtaining in the world market. However, with inventory limitations and allocation of scarce materials still in force, normal trading conditions can hardly return for some time. Items that were decontrolled several months ago, as silver, quicksilver, and platinum, were more or less unsettled throughout November.

The effect of decontrol was viewed as highly constructive, hastening a restoration of a balanced economy. Production is certain to rise as underpriced metals are adjusted upward. Consumption is expected to drop in some classifications as buyers again are compelled to weigh cost factors more closely. A major difficulty in price control as practiced by OPA in the reconversion period was the tendency to favor the consumer. This policy stimulated buying and choked off production, notwithstanding subsidy payments to encourage output.

Excepting growing tension over the coal strike, that brought John L. Lewis and his union before the Court on contempt charges, the market for non-ferrous metals ended December with demands for major metals at record peacetime levels. The only visible sign of unsettlement in connection with the coal dispute was a sharp drop in the operating rate of the steel industry.

Reconversion Director John R. Steelman announced that RFC will continue the Premium Price Plan on copper, lead, and zinc until June 30, 1947, but settlement will be based on market prices instead of ceiling prices. Metal allocated to consumers from RFC stocks also will be billed at market prices. The Civilian production Administration assured consumers of tin that the public purchase program, along with controls on consumption, will continue throughout the first quarter of 1947. In copper and lead the Government's purchase program was terminated, except to take care of commitments already made or in process. Removal of price control also brought to an end the right of the Government to subsidize imports and waive import duties. To get around this situation, RFC intends to pay the prevailing import duty on copper and lead arriving from abroad after Jan. 1, 1947. There was some hope that the 4c. duty on copper might be reduced 2c., or perhaps waived entirely during the period of the emergency, as in lumber, but high officials in Washington turned down all such suggestions.

Copper advanced in the domestic market on Nov. 12, the first trading day after the decontrol order was issued, to 17½c., Connecticut Valley. Most operators believed that this price would hold until more normal conditions again set in after the first shock of decontrol has been absorbed. However, early on Nov. 20, following receipt of an official statement that the Government's purchase program will be terminated, Phelps Dodge raised its price to 19½c. Several small producers followed in raising the price, but Kennecott took no action in meeting the higher level until Nov. 23. Price confusion prevailed over a period of three days.

The sharply higher domestic market for copper caused the world price to advance, final prices for the month in foreign copper showing a range of 18c. to 18¼c., f.a.s. New York equivalent. Nearby copper was particularly tight in the foreign market and on some scattered business as high as 18.75c. and 18.90c. was paid shortly before the month ended. With production outside of the United States expected to expand, buyers were less eager for forward copper other than January and February metal. The British Ministry of Supply purchased an undetermined tonnage of Canadian copper for first half of 1947 shipment on the basis of 17½c., Canadian ports. United States authorities closed a deal for first-quarter copper that was pending at the time that controls went off, paying 17c., Chile.

Should domestic production of refined copper increase to between 85,000 and 90,000 tons a month, as seems likely unless labor disputes again plague the industry, and total needs remain at between 110,000 and 120,000 tons a month, the Government will not be called upon to release as much copper next year to help out consumers. From present indications, the Government will have a total of about 205,000 tons of copper to work with over the next four months. October deliveries of refined copper jumped to 136,481 tons, a new high for the postwar period. Of this total, the Government contributed 51,076 tons. Domestic production of refined copper in October, according to Copper Institute, was 77,947 tons, against 67,803 tons in September.

Lead also experienced two price revisions. The first move took the quotation to the world level of 10½c., New

U. S. Slab Zinc Statistics

(American Zinc Institute)

Production of slab zinc in the United States for recent years, including production from foreign ore, and the record for the first ten months of 1946, in tons:

		Shipments					
	Production	Domestic	Export	Gov't (a)	Total	Unfilled Orders (b)	Stock at End
1943	971,873	831,430	56,208	.....	887,638	44,914	173,510
1944	901,332	830,334	6,988	.....	837,722	21,332	237,520
1945	799,520	762,925	9,422	5,302	777,649	27,092	259,391
1946:							
Jan.	65,901	47,169	2,326	9,140	58,635	32,269	266,657
Feb.	61,274	41,349	886	12,621	54,856	32,707	273,075
March	71,612	66,159	2,324	15,210	83,693	38,168	260,994
April	60,903	60,809	5,676	6,706	73,191	39,018	248,706
May	62,416	60,380	4,120	4,989	69,489	38,791	241,633
June	58,812	51,101	2,550	6,841	60,492	38,230	239,953
July	59,014	58,321	5,559	5,340	69,220	39,083	229,747
Aug.	59,752	43,522	7,678	686	51,886	41,595	237,613
Sept.	58,475	60,130	5,323	474	65,927	42,186	230,161
Oct.	64,138	71,891	2,024	.....	73,915	52,694	220.384

(a) Slab zinc released from Government's stocks. (b) Unfilled orders at end of period.

York, and the second to the world level plus duty and handling charges, establishing the market at 11.80c. The initial change was announced by St. Joseph Lead Co., and the other by American Smelting & Refining Co. Allocation of lead from the "kitty," which consisted of 25 percent of current production of common lead for distribution by CPA, has not been revoked, but this feature of the lead market is not expected to survive for long. Both domestic production and imports of lead are expected to increase. Lifting of price controls ended the agreement with the British in regard to allocating foreign production.

Prime Western zinc was advanced to 10½c., East St. Louis, as soon as price control was dropped. The American Zinc, Lead Co. was first to act, and others followed in a day or two. Though various producers strongly opposed this price level earlier in the year, the industry apparently was willing to try out consumers on the new selling basis. The fact that foreign consumers paid the equivalent of 10½c. was undoubtedly a reason for the action taken by sellers of domestic zinc. So active was the call for Special High Grade zinc that both St. Joseph Lead and American Zinc increased the premium on this grade to 1¼c., or one-quarter cent above the previous differential. In announcing the change, St. Joe declared that the increase in the premium should encourage a greater use of Regular High Grade, of which there appears to be an ample supply.

Tin advanced to 70c. per pound on rather light offerings of the metal by secondary producers. The new price, an advance of 18c. per pound, was accepted as a selling basis by the Government. Tin is in a class by itself, in that the smelter at Texas City, owned by the Government, is the chief source of this country's supply. Consumers were informed that CPA will continue to buy tin concentrates and control the use of the metal throughout the first quarter.

Platinum turned quiet and the price declined to $67 an ounce Troy.

Major Metals

U. S. DAILY AND AVERAGE PRICES

1946 Nov.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
1	14.150	17.425	52.000	8.250	8.100	9.250
2	14.150	17.425	52.000	8.250	8.100	9.250
4	14.150	17.425	52.000	8.250	8.100	9.250
5	Holiday	17.425	Holiday	Holiday	Holiday	Holiday
6	14.150	17.425	52.000	8.250	8.100	9.250
7	14.150	17.425	52.000	8.250	8.100	9.250
8	14.150	17.430	52.000	8.250	8.100	9.250
9	14.150	17.430	52.000	8.250	8.100	9.250
11	Holiday	17.425	Holiday	Holiday	Holiday	Holiday
12	17.275	17.425	70.000	10.500	10.350	10.500
13	17.275	17.425	70.000	10.500	10.350	10.500
14	17.275	17.425	70.000	10.500	10.350	10.500
15	17.275	17.425	70.000	10.500	10.350	10.500
16	17.275	17.425	70.000	10.500	10.350	10.500
18	17.275	17.425	70.000	11.800	11.650	10.500
19	17.275	17.425	70.000	11.800	11.650	10.500
20	18.430	17.675	70.000	11.800	11.650	10.500
21	19.175	17.750	70.000	11.800	11.650	10.500
22	18.600	18.050	70.000	11.800	11.650	10.500
23	19.275	17.750	70.000	11.800	11.650	10.500
25	19.275	17.925	70.000	11.800	11.650	10.500
26	19.275	17.925	70.000	11.800	11.650	10.500
27	19.275	18.050	70.000	11.800	11.650	10.500
28	Holiday	18.050	Holiday	Holiday	Holiday	Holiday
29	19.275	18.050	70.000	11.800	11.650	10.500
30	19.275	18.050	70.000	11.800	11.650	10.500
AVERAGES FOR MONTH						
Nov.	17.036	17.619	64.522	10.437	10.287	10.120
AVERAGES FOR WEEK						
6	14.150	17.425	52.000	8.250	8.100	9.250
13	15.400	17.427	59.200	9.150	9.000	9.750
20	17.468	17.467	70.000	11.150	11.000	10.500
27	19.146	17.908	70.000	11.800	11.650	10.500
CALENDAR WEEK AVERAGES						
Nov. 2	14.150	17.425	52.000	8.250	8.100	9.250
9	14.150	17.427	52.000	8.250	8.100	9.250
16	17.275	17.425	70.000	10.500	10.350	10.500
23	18.338	17.679	70.000	11.800	11.650	10.500
30	19.275	18.008	70.000	11.800	11.650	10.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1946 Nov.	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	403.000	90.125	55½d.	172s. 3d.	$35.00
2	403.000	(e)	(e)	(e)	35.00
4	403.000	90.125	55½d.	172s. 3d.	35.00
5	Holiday	Holiday	55½d.	172s. 3d	Holiday
6	403.000	90.125	55½d.	172s. 3d.	35.00
7	403.000	90.125	55½d.	172s. 3d.	35.00
8	403.000	90.125	55½d.	172s. 3d.	35.00
9	403.000	(e)	(e)	(e)	35.00
11	Holiday	Holiday	55½d.	172s. 3d	Holiday
12	403.000	90.125	55½d.	172s. 3d.	35.00
13	403.000	90.125	55½d.	172s. 3d.	35.00
14	403.000	90.125	55½d.	172s. 3d.	35.00
15	403.000	90.125	55½d.	172s. 3d.	35.00
16	403.000	(e)	(e)	(e)	35.00
18	403.000	90.125	55½d.	172s. 3d.	35.00
19	403.000	90.125	55½d.	172s. 3d.	35.00
20	403.000	90.125	55½d.	172s. 3d.	35.00
21	403.000	90.125	55½d.	172s. 3d.	35.00
22	402.875	90.125	55½d.	172s. 3d.	35.00
23	403.000	(e)	(e)	(e)	35.00
25	403.000	90.125	55½d.	172s. 3d.	35.00
26	402.875	90.125	55½d.	172s. 3d.	35.00
27	402.875	90.125	55½d.	172s. 3d.	35.00
28	Holiday	Holiday	55½d.	172s. 3d	Holiday
39	402.875	90.125	55½d.	172s. 3d.	35.00
30	402.875	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
Nov.	402.973	90.125	55½d.	—	35.00
AVERAGES FOR WEEK					
6	403.000	90.125	—	—	—
13	403.000	90.125	—	—	—
20	403.000	90.125	—	—	—
27	402.938	90.125	—	—	—

Calendar week averages, New York Silver: Nov. 2nd, 90.125; 9th, 90.125; 16th, 90.125; 23rd, 90.125; 30th, 90.125.

(e) Not quoted (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Effective March 14, our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead are for common lead.

(c) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions, and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS—Trends and Prices

Maximum Selling Prices for United Kingdom

Following are the maximum selling prices for copper, lead, zinc, and tin posted by the Ministry of Supply for the United Kingdom. The quotations include delivery charges to the consumer's plant.

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	98	0	0
Fire refined, high conductivity	98	0	0
Fire refined, high grade	97	10	0
Fire refined, min. 99.7 percent	97	0	0
Fire refined, min. 99.2 percent	96	10	0
Hot rolled black wire rods	103	0	0
LEAD:			
Soft, foreign, duty paid	55	0	0
Soft, Empire	55	0	0
English refined	56	10	0
ZINC:			
Foreign (G.o.b.), duty paid	55	0	0
Domestic (G.o.b.)	55	0	0
Prime Western and debased	55	0	0
Refined and electrolytic	55	15	0
Minimum 99.9 percent	57	5	0
TIN:			
Ingot, 99 percent	380	10	0

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for October and November:

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	Oct.	Nov.
Quicksilver, N. Y. flask	95.192	89.391
Antimony (a)	15.839	22.125
Antimony, bulk, Laredo	14.500	20.761
Antimony, bulk, N. Y.	15.265	21.550
Antimony, Chinese (b)	16.500	Nom'l
Platinum, oz. troy	76.731	68.957
Cadmium (c)	125.000	125.000
Cadmium (d)	127.500	127.500
Cadmium (e)	130.000	130.000
Aluminum ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1937	90.86
1930	82.87	1938	73.67
1931	60.20	1939	77.71
1932	48.26	1940	79.22
1933	59.79	1941	83.49
1934	65.59	1942	86.80
1935	74.66	1943	88.74
1936	73.45	1944	88.74
1945	90.86		

	1944	1945	1946
January	88.74	88.74	96.42
February	88.74	88.74	96.42
March	88.74	88.74	96.42
April	88.74	88.74	96.42
May	88.74	88.74	96.42
June	88.74	88.74	107.16
July	88.74	88.74	117.11
August	88.74	88.74	113.32
September	88.74	91.16	113.32
October	88.74	96.40	114.25
November	88.74	96.42	131.23
December	88.74	96.42	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(December 2, 1946)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, domestic, spot, lb., 5 tons or more, in cases	24.875c.
Bismuth, ton lots, lb.	$1.80
Cadmium, commercial sticks, lb.	$1.50
Calcium, lb. ton lots, 97 @ 98 percent, cast	$1.85
Chromium, 97 percent grade, lb.	89c.
Cobalt, 97 to 99 percent, per lb.	$1.50
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 percent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$67.00
Quicksilver, flask of 76 lb., 25 flasks or more	$89.00
Selenium, 99.5 percent, lb.	$1.75
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$17.50
Titanium, 96 to 98 percent, lb.	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$8.00@$10.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal)	$38.00@$39.00
48% Cr_2O_3, 3 to 1 ratio	$40.00@$41.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range besseme	$5.45
Mesabi bessemer	$5.20
Old Range non-bessemer	$5.30
Mesabi, non-bessemer	$5.05
Lead (Galena) 80 percent, Joplin, Mo., ton	$151.02
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 percent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo. (Current prices in open market nominal at 70@75c. per long-ton unit.)	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid	$22.00
Domestic, scheelite, 60 percent and upward	$24.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	6c.
Cobalt Oxide, 70 to 71 percent, lb.	$1.06
Copper Sulphate, 100 lb.	$7.10

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent per lb. of Cr contained	13c.
Ferromanganese, 78 to 82 percent, gross ton	$135.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	6.60@8.10c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V delivered	$2.70@$2.90
Silicomanganese, 1 percent C, gross ton	$138.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$8.50@$9.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.25@$8.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$5.00
Domestic, chemical, 55 to 58 percent	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 60 percent, all rail movement, ton	$30.00
Acid 98 and 1 percent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica: Domestic producers quote on punch and sheet as follows: Punch, 22c. per pound; 1½x2 inch, $1.10; 2x2 inch, $1.60; 2x3 inch, $2.10; 3x3 inch, $2.75; 3x4 inch, $3.50; 3x5 inch, $4; 4x6 inch, $5. Wet ground, very fine, $90 per ton. Special grades command premium. Bulk sales dry ground, $32.50 per ton. Scrap, $28 per ton and up.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c i f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$28.00
Steel, base price, Pittsburgh Billets, gross ton	$39.00
Structural shapes, 100 lb.	$2.35

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

New Rules Announced for Premiums on Exploration

Four amendments to previous instructions to applicants for exploration premiums have been adopted recently by the Quota Committee for the Premium Price Plan for copper, lead, and zinc.

The first new amendment (6A) provides that larger operators, producing more than 600 tons of metal in the year ended June 30, 1946, include in their estimates only those costs which will be increased by the exploration project. This is intended to keep overhead down as much as possible.

Amendment 6B instructs operators not to change their accounting methods in reporting exploration projects. Amendment 6C asks that reports on exploration be kept separate from operations reports and be labeled as such at the top of the first page. The last amendment (6D) rules that applicants for exploration premiums list the chances of success in finding ore, using a percentage system, with 100 percent as certainty.

Most Government Controls Have Been Abandoned

Close on the heels of President Truman's announcement of the end of price control came the Civilian Production Administration's double-barreled move ending all but a shred of its domestic controls on copper and lead, and all of the Government-subsidized imports of metals.

The end of all importing of copper and lead by the Government followed automatically. By law (Emergency Price Control Act of 1942, as amended in 1946) the subsidy importation of metallic copper, lead, and tin ended with price control, leaving RFC with imports on a duty-free, "business-risk" proposition. CPA, after consultation with RFC, later announced that all imports of copper and lead would end with the contracts already in force for the fourth quarter of this year. Later, an exception was made for first-quarter deliveries of some Chilean production, but without waiver of duty. This puts industry back on an open world market, with the duty no longer waived.

Tin metal and concentrate will continue to be imported by the Government until March 31, 1947, and the CPA will continue its import restrictions as contained in order M-63, and domestic use and quota controls under tin order M-43.

Some small quantities of antimony will be purchased from China, based on an agreement made with that country in 1941.

The end of public purchase of metals does not end all of the Government restrictions on industry. The 25 percent set-aside from domestic production of lead will continue in effect to maintain a pool for domestic hardship cases. The lead stockpile of approximately 38,000 tons remains frozen for emergency use for public health and safety. The 160,000-ton copper stockpile will be doled out to consumers unable to obtain copper for as long as it lasts. Inventory controls on the two metals will remain for a while at least, to prevent hoarding and too great an unbalance in industrial inventories.

The jump in prices of copper, lead, and zinc after the fall of price control forced the Government to change its method of computing earnings for mines under the Premium Price Plan. Now the Quota Committee has a "cents-per-pound" instead of an alphabetical range for quota production, but points out that the program will continue as heretofore in all other respects. The profit differentials will remain the same as under the A, B, and C quotas, it was announced. The plan will discount price changes based on *E. & M. J.* average prices.

With copper and lead bullish at 19½ and 11.8c., respectively, and zinc 2¼c. above the wartime ceiling, many mines will go out from under the plan automatically.

Advocates of making the Premium Price Plan permanent are apparently in for a determined battle. Already reports are circulating in Washington that this particular subsidy is slated for the legislative ax along with other subsidy programs. The fate of the Texas City "Longhorn" tin smelter is also rumored to be in doubt.

Miller Is Appointed as USBM Assistant Director

Thomas H. Miller, assistant chief of the Economics and Statistics Branch of the Bureau of Mines since early in 1945, has been appointed assistant director of the Bureau to fill one of two vacancies left by recent resignations.

The appointment of Mr. Miller is one of several impending important changes in policy and planning procedures in the director's office. Under the new set-up, the two assistant directors will work as staff men to Dr. R. R. Sayers, director. In addition, the six branch chiefs will constitute an advisory board for review of planning and new policy. They will now report directly to Dr. Sayers, instead of to an assistant director as heretofore. The reports from branch chiefs to the director will then be passed on to the assistant directors for action if needed. This is a move to speed up the reporting functions of the Bureau and cut out the "middleman" delay.

Mr. Miller, who has been associated with the Bureau of Mines for nearly 20 years, replaces George A. Lamb, assistant director since 1944, who resigned in October. The other assistant director, to replace Dr. Reginald Dean, has not yet been appointed.

Long List of Minerals May Have Tariff Cuts

One of a series of steps to work out a program of international economic collaboration between the United States and 18 other nations will be taken Jan. 13 when the Committee for Reciprocity Information, set up under the Trade Agreements Act of 1934, opens hearings in Washington to consider statements of American businessmen concerning possible tariff reductions on a long list of commodities.

Minerals which may be subject to tariff reductions or concessions are: aluminum metal, scrap, ore, and products; copper ore, concentrates, metal, scrap, and products; brass and bronze; nickel ore, metal, alloys, and products; tin ore, metal, scrap, and alloys; zinc ore, metal, scrap, dross, and products; antimony needle and metal; magnesium metal, scrap, alloys, and products, and iron and steel metal and manufactured products. Other minerals also included in the State Department list include: Beryl, cadmium, chrome, cobalt, manganese, platinum, selenium, titanium ore, tungsten, petroleum and products, stone, lime, cement, gypsum, glass and products, clay and products, chalk, abrasives, asbestos, mica, graphite, talc, diamonds and precious and semi-precious stones, mineral-earth pigments (except natural iron oxide, siennas, and ground barytes), and chemical pigments (except lampblack and certain other black pigments, chromium pigments, precipitated calcium sulphate, and vermilion reds). Metallic lead is conspicuously absent, but the chemical and mineral-earth pigments listed include such compounds as litharge, orange mineral, red lead, white lead, and leaded zinc oxides.

Deadline for submission of briefs and applications to be heard by interested parties is noon, Dec. 21. Communications should be addressed to "The Chairman, Committee for Reciprocity Information, Tariff Commission Building, Eighth and E Streets, N. W., Washington 25, D. C."

NEWS OF THE INDUSTRY

Southwest Mining Men Gather at El Paso

The third annual International Mining Days' celebration, which opened Oct. 31 in El Paso and continued through Nov. 2, registered an attendance of 750 mining men from Texas, New Mexico, Arizona, Colorado, other parts of the United States, and Mexico. Highlights of the meetings were a description of the Morenci open-pit development in Arizona, attacks on the Government's "arbitrary" restrictions on metal prices, and pleas for an early return of the free market.

Louis S. Cates, of New York, president of the American Institute of Mining and Metallurgical Engineers and head of the Phelps Dodge Corporation, attacked the Government's price policy on copper at a special meeting of the El Paso Metals Section of the A.I.M.E. which opened the celebration. Because of the tremendous demand, Mr. Cates regarded the outlook for copper as "wonderful," adding: "There are two years of good business ahead. It will take that long to catch up with demands."

The Morenci enterprise was described by H. M. Lavender, of Douglas, Ariz., vice president and general manager of Phelps Dodge Corporation. It was during the war, he explained, when copper was cut off from Africa and other points, that the Morenci development, with speeded-up operations, came into the picture and supplied this vital war material. The entire development represents an investment of $70,000,000, according to Mr. Lavender, and it was responsible for doubling the capacity of the Phelps Dodge refinery in El Paso. The process of turning an original underground mine into an open-pit operation was started in 1937, and by 1942 it was in full operation. The present daily output of ore is about 50,000 tons. The development was carried out only after years of research and experimentation. Solution of the Morenci water problem, Mr. Lavender said, required an expenditure of $5,000,000, including construction of a dam 250 miles from the mine site.

Julian D. Conover, of Washington, secretary of the American Mining Congress, also attacked the Government's "arbitrary" restrictions on copper prices.

Turning to taxation, Mr. Conover declared: "The mining industry needs freedom from excessive taxes, which do not recognize the special character of mining, in order to provide incentive to undertake the risks of exploring for and development of additional reserves and new mines. It takes courage, financial risks, and willingness to take chances, which are fortified only if there is an opportunity for a commensurate reward."

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Yugoslavs to Expropriate Foreign-Owned Mines

The British-owned Trepca lead and zinc mines and the French-owned Bor copper mines may be expropriated by the Yugoslav Government without compensation, according to recent statements by Andrija Hebrang, chairman of the Yugoslav State Planning Commission. Trepca was a major producer of lead and zinc prior to the war (*E.&M.J.*, Sept. 1946).

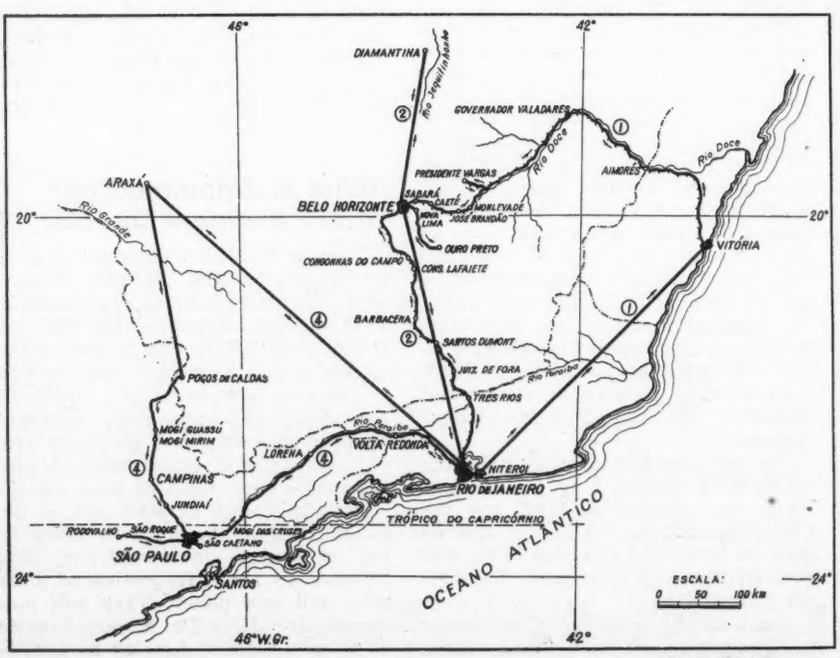
The State claims that the Bor mines had become German property at the time of liberation, by virtue of German purchases of shareholdings. It is indicated that the Trepca owners will be charged with having helped to finance the Mikhailovitch faction and will be classified as collaborators.

Pan American Congress Delegates Enjoy Well-Rounded Program of Field Trips

An important part of the meeting of the second Pan American Congress of Mining Engineering and Geology, held at Petropolis, near Rio de Janeiro, Brazil, Oct. 1 to 15, was the well-planned program of visits to mines, smelters, industrial plants, and technical schools in which the more than 400 delegates and guests were enabled to participate. Five different schedules were organized; two of these had to be combined because of bad weather conditions. The accompanying sketch map shows the routes of the four trips.

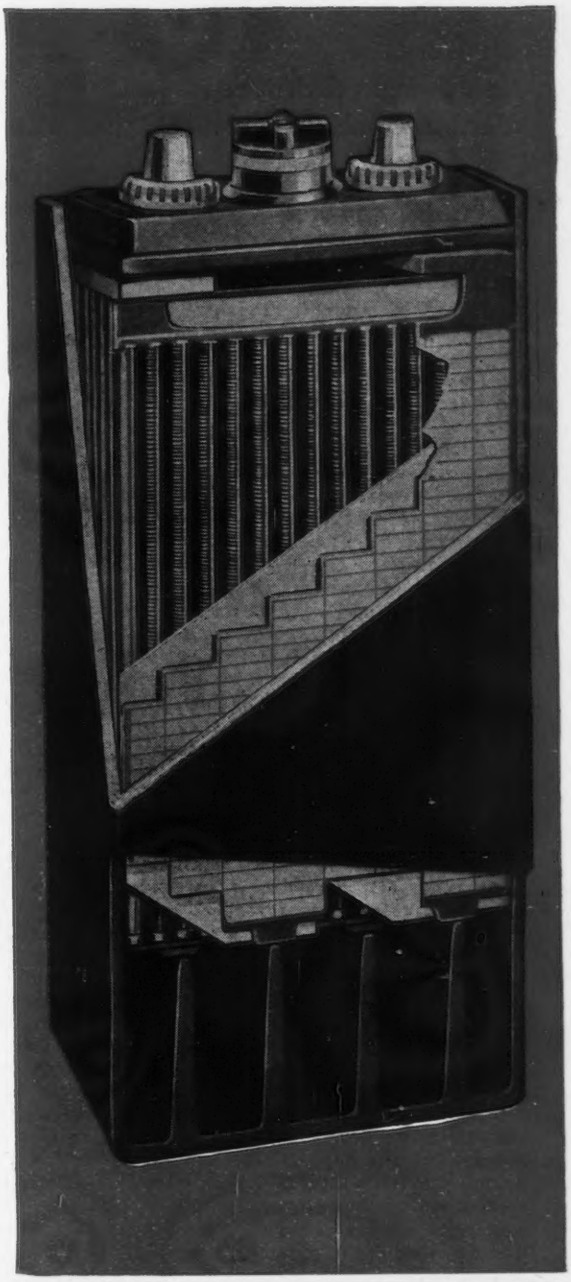
Trip No. 1 had the purpose of showing the pig-iron industry of Minas Geraes and the mining of iron ore for exportation. Visitors proceeded by plane to Victoria, where they saw the large bins which feed bessemer grade, compact hematites from Itabira to ocean-going vessels for shipment to the United States and England. The next stopping point was Valladares,

(*Continued on page* 141)



Exide

IRONCLAD BATTERIES



BUILT FOR PEAK PERFORMANCE AND LONG LIFE IN HEAVY-DUTY SERVICE...

The Exide-Ironclad is a different type of battery . . . in design, construction, service qualities. It was developed to meet the need for a battery to deliver high, sustained power in heavy-duty service over a long period of time.

THE POSITIVE PLATE is unique in battery design. It consists of a series of slotted, vertical, hollow tubes which contain the active material (See illustration at left). The slots in the tubes are so fine that, while they permit easy access to the electrolyte, they prevent the lead oxide from readily washing out, thus adding considerably to the life of the plate.

THE NEGATIVE PLATE has been designed and is built to equal the increased life of the positive plate. Like the positive plate, it has two feet at the bottom to raise it above the two supporting ribs.

SEPARATORS are made of Exide Mipor, a special rubber composition, and will match the long life of Exide-Ironclad plates. The cutaway illustration shows how separators rest on ribs well below bottom of plates, thus making probability of internal short circuits very remote.

THE EXIDE-IRONCLAD ASSEMBLY is sealed in jars of Giant Compound. Jars are practically unbreakable in normal service.

THE RESULT is an efficient, ruggedly built battery that assures dependable performance, long life and maximum economy . . . a battery that fully measures up to each service requirement . . .

★ ***HIGH POWER ABILITY*** . . . needed in frequent "stop and go" service.

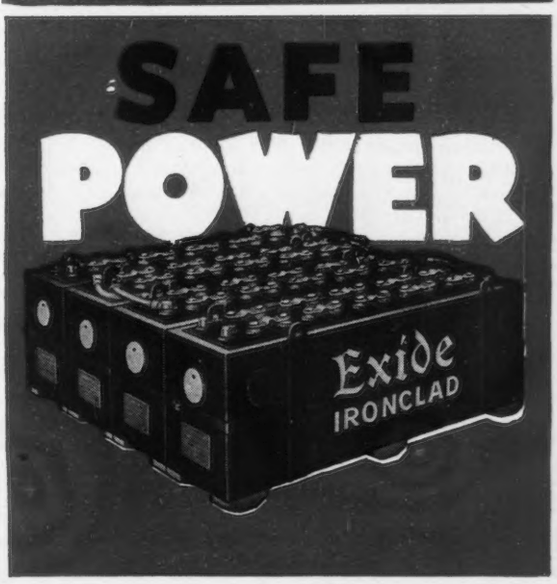
★ ***HIGH MAINTAINED VOLTAGE*** throughout discharge.

★ ***HIGH ELECTRICAL EFFICIENCY*** that keeps operating costs low.

★ ***RUGGED CONSTRUCTION*** . . . for long life.

Exide-Ironclads are supplied in sizes to suit every application, including mine locomotives, trammers and shuttlecars of every size and make.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto



New Program Proposed for Montana School of Mines

Broadening and streamlining of curricula at the Montana School of Mines to insure the graduation of engineers "able to meet the present-day challenge of the mineral industry" has been recommended by a 27-man committee of alumni, students, and faculty of the school. The committee was appointed by President Francis A. Thompson in November 1945 for the purpose of conducting a detailed study of courses and methods of instruction and recommending changes.

The opinions of hundreds of alumni and representatives of the mineral industry were studied by the committee in an effort to key the objectives of the study to the engineering requirements of the industry as they exist today or may develop tomorrow. Typical suggestions for improvements in instructional procedures called for a transfer of emphasis from purely technical subjects to the basic sciences; attention to greater proficiency in English and report writing; recognition of the increasing importance of geophysical prospecting methods; inclusion of more courses designed to develop individual initiative; indoctrination of students in human relations, labor laws, and personnel problems; and the development of student consciousness of the industry's dependence on the mining schools for the managers, executives, and leaders of the future.

The broad objectives formulated from the views of industry and alumni were made the basis of a searching examination into the curricula and procedures at the school, from which the committee evolved specific recommendations for broadening the technologies, eliminating deadwood, strengthening the basic sciences, allotting more time to general education, and devising a more logical sequence of courses.

Gold Production Records Additional Gains

Mine production of gold in the United States increased 10 percent in September, the U. S. Bureau of Mines reports. Alaskan output reached its highest level since 1941, recording a 32 percent gain over the record for the previous month. Utah production increased 26 percent and is now back to normal after recovering from the effects of the five-month strike at Bingham Canyon. The only major drop in output was recorded in Idaho, where the Bradley Mining Co. temporarily discontinued milling gold-antimony ore at its Yellow Pine property. Production by states is shown in the accompanying table.

Domestic silver production totaled 2,030,749 oz. in September, compared with 2,051,828 oz. in August and a monthly average of 1,529,991 oz. during the first half of 1946.

U. S. Mine Production of Gold in Fine Ounces

Region and State	1945 (Monthly Average)	Aug. 1946	Sept. 1946
Eastern States	155	133	132
Western States			
Arizona	6,435	6,000	6,300
California	12,328	33,500	34,000
Colorado	8,411	12,042	12,096
Idaho	1,482	6,050	4,550
Montana	3,717	7,100	7,000
Nevada	7,689	7,150	6,500
New Mexico	467	343	345
Oregon	372	1,675	1,800
South Dakota	4,662	26,266	26,275
Texas	....	6	5
Utah	23,332	18,600	23,500
Washington	4,822	3,800	4,200
Wyoming	....	5	....
	73,717	122,537	126,571
Alaska	5,676	38,949	51,530
Total: United States	79,548	161,619	178,233

Nuclear Energy Discussed At N. Y. Section of A.I.M.E.

The tremendous energy tied up in the nucleus of the atom was discussed by Dr. K. K. Darrow, research physicist of the Bell Telephone Laboratories, at the Oct. 30th meeting of the New York Section of the A.I.M.E. Bernard M. Baruch's report to the United Nations' Atomic Energy Commission on nuclear energy was also discussed briefly.

To illustrate the magnitude of nuclear energy, Dr. Darrow stated that the nucleus of a simple atom such as deuterium (heavy hydrogen which has an atomic mass of 2, a positive charge, and is indicated by the symbol $_1H^2$) possesses a tied-up energy of 2.4 million electron volts, as compared with the kinetic energy of a molecule of TNT, which is only 2 or 3 electron volts.

Dr. Darrow emphasized a statement which appeared in the Baruch report acknowledging that "a number of difficult technological problems" remain yet to be solved before nuclear power plants can be operated successfully. He also quoted from a companion report to the United Nations committee which stated that radioactive isotopes, particularly carbon (C^{14}) may be useful as a tracer in studying the diffusion of an element in an alloy, and in the identification of inclusions by radiographic methods.

Secrecy Surrounds Czech Uranium Deposits

Volume and disposal of uranium production from the Jachymov mines, in the Sudetenland, were stated to be "economic secrets" by a spokesman for the Czechoslovak Ministry of Industry on Nov. 4. He asserted that only two or three shafts are open and that no additional ore discoveries have been made in the area recently. Foreign reports indicate that the ores are moving to Dresden, Germany, where the Germans processed uranium during the war. It is said that the former Czech processing plant at Jachymov, destroyed by the Germans, has not been rebuilt.

Official knowledge of reported uranium mining operations on the German slope of the Schneeberg Mountains, in Russian-controlled territory, was denied by the Czech Government spokesman, but termed "theoretically" possible from the geological standpoint.

New Laboratory Utilizes X-Ray Diffraction

Facilities of the Department of Mineralogy, Harvard University, were augmented on Nov. 1 with the formal dedication of the Harry Berman Memorial Laboratory. The laboratory will be devoted to X-ray diffraction and is equipped to carry on research in mineralogy and its applications to the broader fields of medicine and industry. Accredited mining companies will have an opportunity to present special mineralogical problems which come within the scope of laboratory investigations.

The laboratory was donated to the university by friends and associates of the late Dr. Harry Berman, professor of mineralogy, who lost his life in an airplane crash while en route to England to conduct special studies for the Royal Air Force.

Engineers' World Congress Convenes in Paris

Twelve hundred of the world's leading engineers, drawn from all trades and from thirty countries, met Sept. 16 to 21 in an International Technical Congress in Paris. The delegates, of whom about 640 were from France and 130 from Britain, exchanged information in a dozen languages, visited industrial plants, and heard papers on the present and future tasks of engineering on this globe.

A significant result of the Congress was the unanimous decision by the chief delegates from all countries to set up an interim organization, which, it is hoped, will develop into a World Engineering Federation. This federation would mobilize the engineering knowledge of the world to aid the various United Nations bodies in such tasks as reconstruction, economic advancement, and the spread of engineering knowledge and cooperation.

The interim organization, to be known as the World Engineering Conference, will be composed of representatives from engineering societies of all nations. It will be directed by an executive board representing twelve

(*Continued on page* 99)

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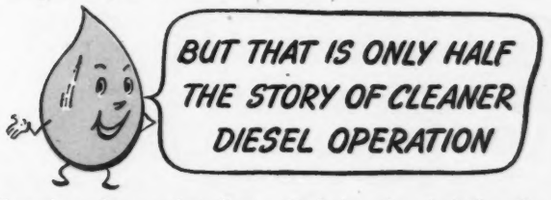

Keeping the engine from sludging is a job for the lube oil . . . and Shell Talpex Oil is doubly protected for this task.

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The Shell Lubrication Engineer will give you sound advice about the fuels and lubricants for any type of Diesel, whether slow-, medium-, or high-speed. Shell Oil Company, Incorporated, 50 West 50th St., N. Y. 20, N. Y.; or 100 Bush St., San Francisco 6, Calif.

SHELL DIESEL FUELS AND LUBRICANTS

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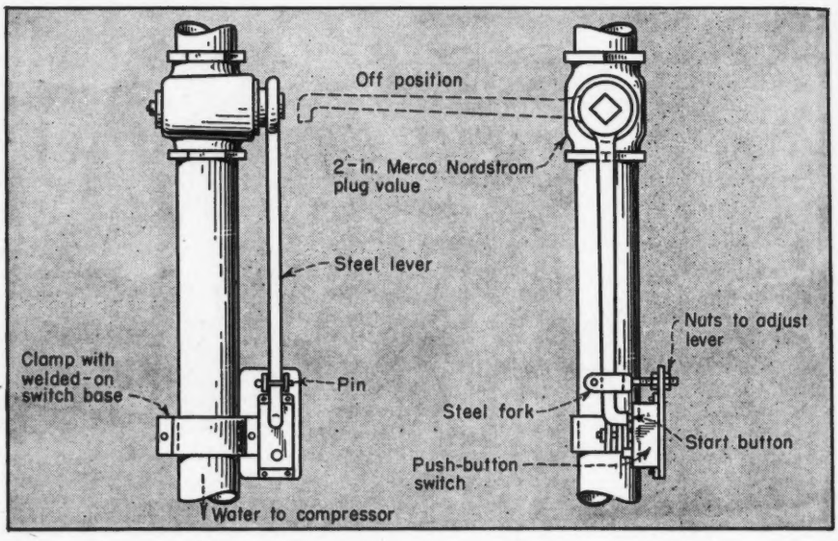
OPERATING IDEAS

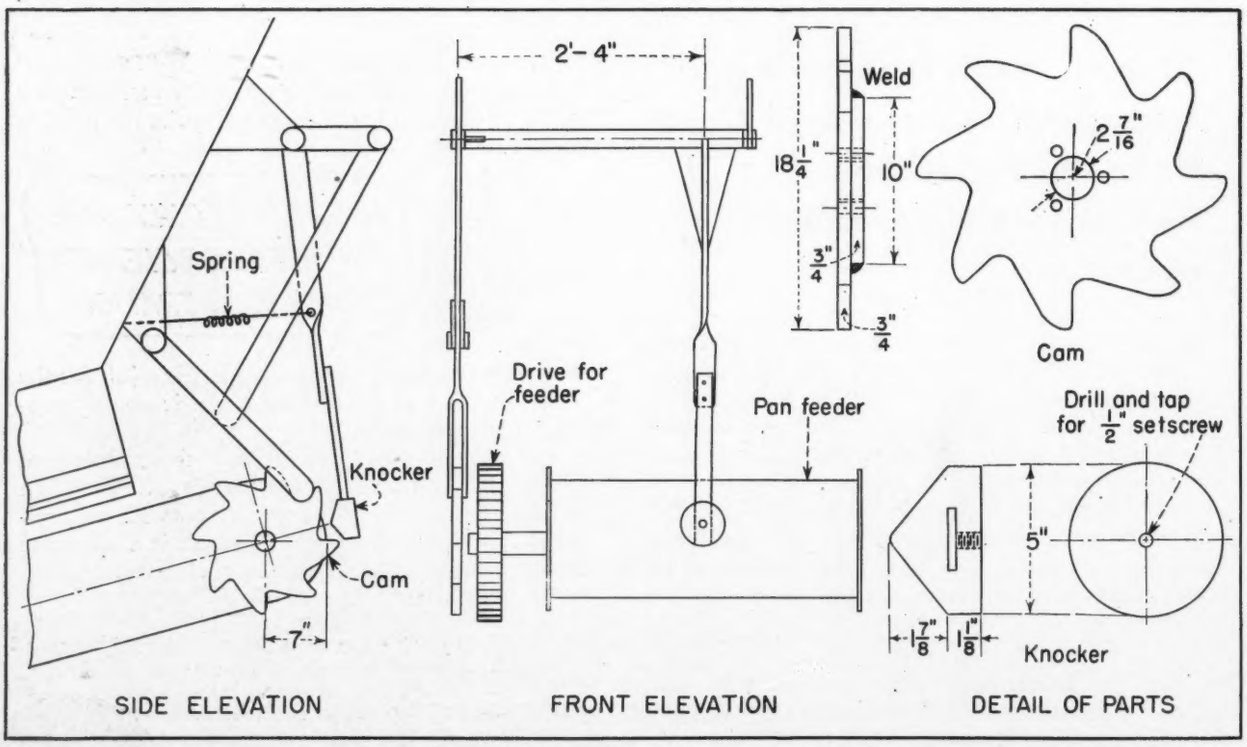
Starter Averts Damage to Compressor

If the operator fails to turn on the water jacket before starting a compressor, considerable damage may be done to the equipment. To prevent this occurrence, Phil Keast, master mechanic, Empire Star Mines Co., Ltd., Grass Valley, Calif., designed and installed the illustrated starter arrangement.

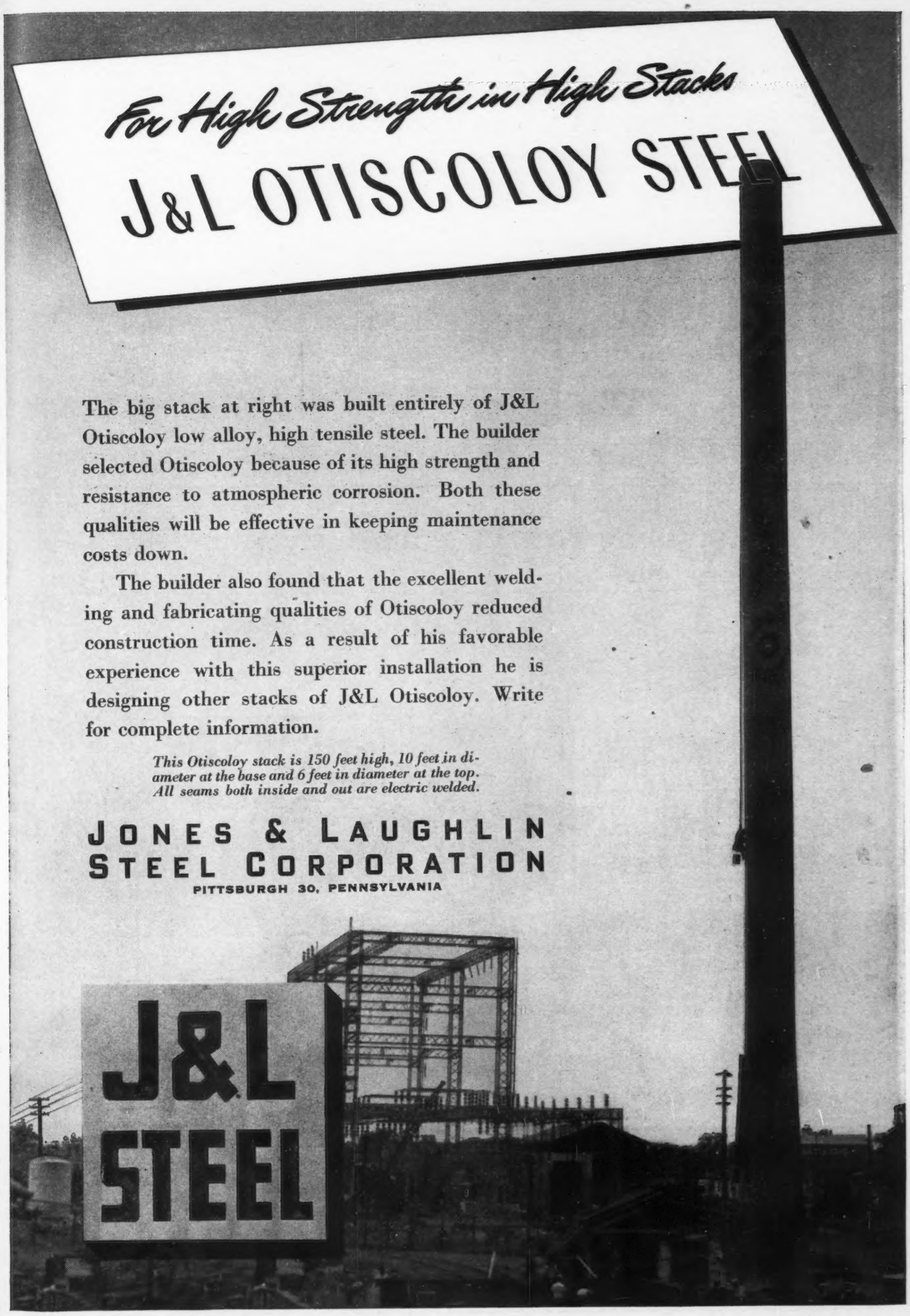
The starter assembly includes a 2-in. Merco Nordstrom plug valve, a standard pushbutton switch connected in series with the holding coil on the main switch, a steel arm with a small knob at the lower end to hit the starter button, and an adjustable fork with stop pin to hold the lever end against the starter button. To stop the compressor, the operator removes the pin and pulls the lever horizontal.



Knocker Cleans Pan-Feeder Plates



This knocker strikes the plates of a pan feeder carrying a moist feed which has a tendency to stick after the plates have gone over the end pulley. The knocker is adjusted to hit the plates just after the principal load has fallen off. Timing of the blows is adjusted by slipping the cam and retightening it. The idea has been contributed by W. S. Skeels, general manager of the Aluminum Ore Co., Rosiclare, Ill., where the device was designed and installed. The cam is made of welded mild steel.


For High Strength in High Stacks
J&L OTISCOLOY STEEL
The big stack at right was built entirely of J&L Otiscoloy low alloy, high tensile steel. The builder selected Otiscoloy because of its high strength and resistance to atmospheric corrosion. Both these qualities will be effective in keeping maintenance costs down.
The builder also found that the excellent welding and fabricating qualities of Otiscoloy reduced construction time. As a result of his favorable experience with this superior installation he is designing other stacks of J&L Otiscoloy. Write for complete information.
This Otiscoloy stack is 150 feet high, 10 feet in diameter at the base and 6 feet in diameter at the top. All seams both inside and out are electric welded.
JONES & LAUGHLIN STEEL CORPORATION
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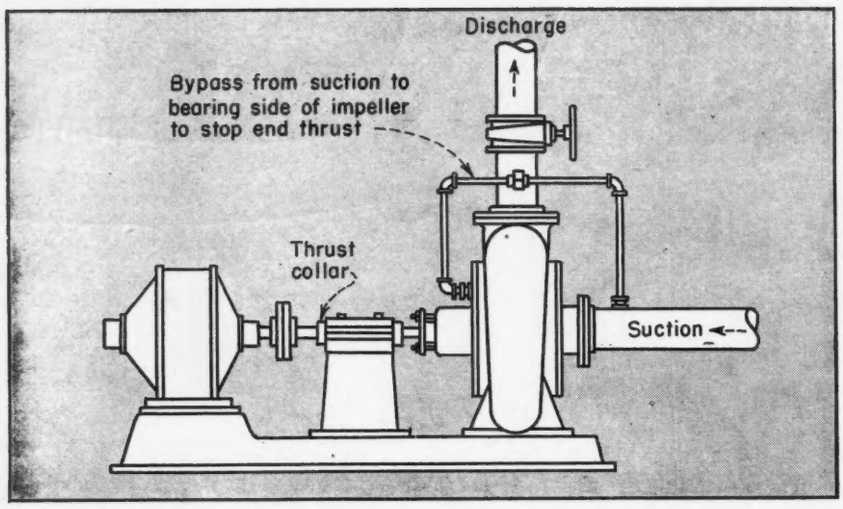
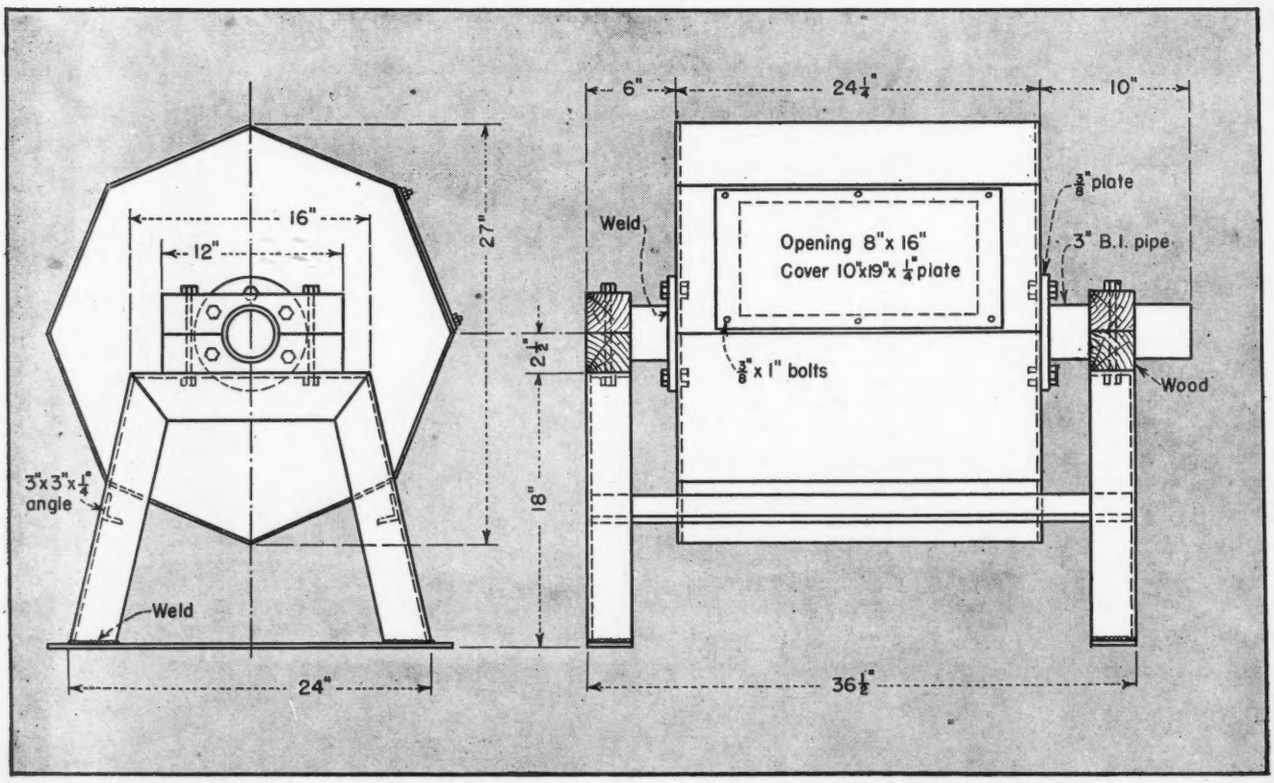
Simple Bypass Eliminates End Thrust in Pump



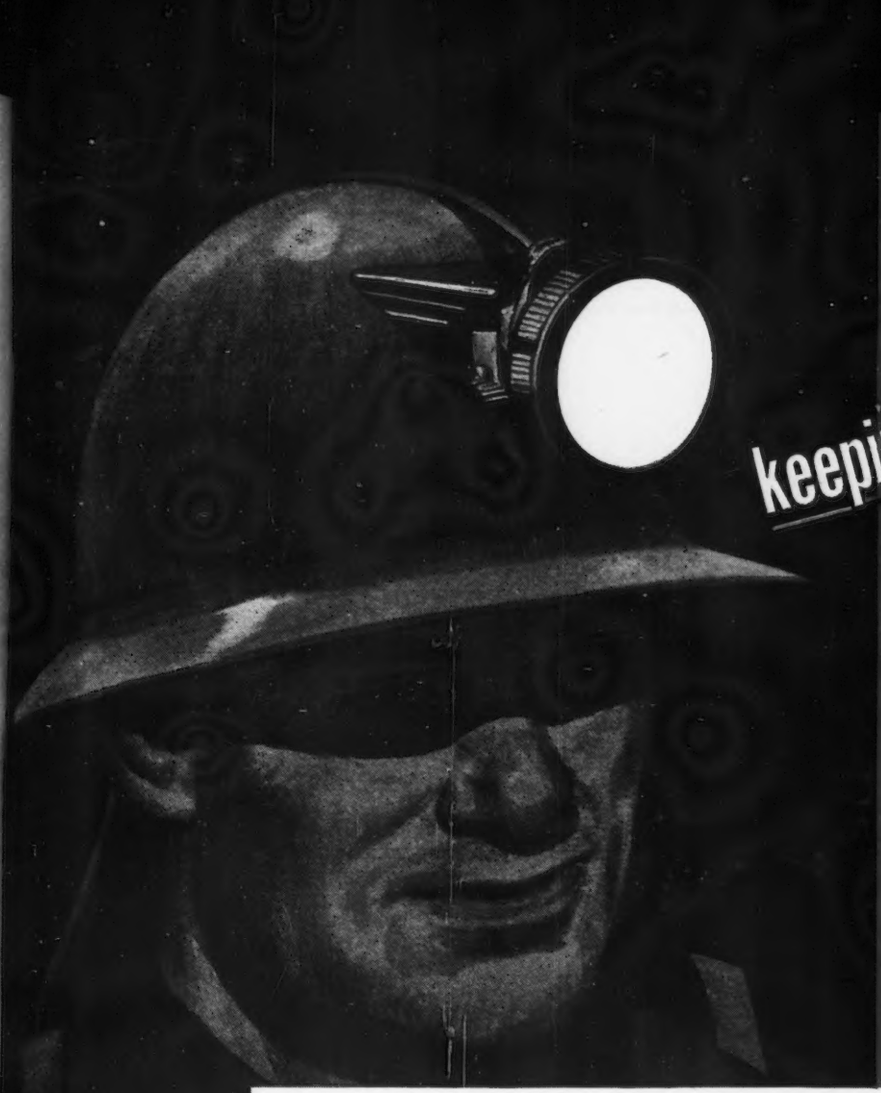
This single-stage centrifugal pump caused considerable trouble at a gold-silver mine in Central Mexico because the impeller was pulled over against the side of the pump casing. An attempt was made therefore to provide a thrust bearing on the outer end of the bearing in place of the thrust collar indicated. The alteration worked, but the thrust bearing wore rapidly and the practice had to be discontinued. The trouble was finally overcome by connecting a ½-in. bypass from the suction pipe to the other side of the impeller, as shown. This removed all the end thrust from the pump shaft except that which could be resisted by the thrust collars.

Tumbling Barrel Cleans Rusty Fittings



Rusty pipe fittings and metal parts such as bolts, nuts, chains, and spikes salvaged from mine operations may be restored to usefulness in the tumbling barrel shown in the accompanying illustration, submitted by A. R. Farrell, master mechanic, of Kirkland Lake Gold Mining Co., Ltd., Chaput-Hughes, Ontario, where this equipment has been in operation with success for some time.

Used or rusty parts are placed in the barrel, which is partly filled with an abrasive mixture of sand, cinders, and sawdust. The drum is driven from the machine-shop line shaft at 25 r.p.m. The cleaning treatment lasts about a half hour, and is sufficient to remove dirt, scale, and rust.



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PERSONAL NEWS

E. D. Wingfield has been appointed general manager of Freeport Sulphur Co. Mr. Wingfield, who has held operating, sales, and executive positions with Freeport since 1933, has been assistant general manager for about the past two years. He will continue to have offices in New Orleans, headquarters for the company's mines in Texas and Louisiana.

John R. Aho, mining engineer for the Oliver Iron Mining Co. at Ely, Minn., has been appointed mining captain of the Pioneer iron mine, on the Vermilion range at Ely. **James D. Warner,** efficiency engineer on the same range, has been appointed captain of the Sibley mine, also at Ely, succeeding **A. C. Solem,** who recently was appointed superintendent of the Fraser mine, at Chisholm, Minn., on the Mesabi range.

C. Travis Anderson has been replaced as chief of the Metallurgical Branch of the Rolla Division of the U. S. Bureau of Mines by **R. G. Knickerbocker.** Mr. Anderson is being transferred to the Electro-Metallurgical Laboratory of the Bureau at Albany, Ore., where he will supervise research on the reduction of zirconium. Mr. Knickerbocker was formerly Chief of the Metallurgical Branch of the Bureau in Washington, D. C.

Trevor Morgan, formerly deputy mining recorder at Winnipeg, for the Mines Branch, Department of Mines and Natural Resources, who recently received his discharge from the Canadian Army with the rank of captain, has been appointed mining recorder for The Pas mining district of Manitoba.

G. A. Roush, editor *The Mineral Industry* from 1914 to 1942, and formerly associate professor of metallurgy at Lehigh University, who since 1943 had been serving as mineral technologist for the U. S. Bureau of Mines at College Park, Md., and Washington, D. C., in the preparation of special reports dealing with wartime activities of the Bureau, has been transferred to the procurement division of the Treasury Department, to serve as metals engineer in the Strategic and Critical Materials Division, the organization developed to handle the purchase and stockpiling of materials necessary for defense, as authorized in the Strategic Materials Act recently passed by Congress. His home address is 4416 Seventeenth St. N., Arlington, Va.

L. H. Hart has resigned from the position of geologist in charge of Western exploration with the United States Smelting, Refining & Mining Co., to become exploration engineer for the American Smelting & Refining Co. His new work will include foreign examinations under the direction of the New York office. His first assignment will take him to Mexico for most of the winter. Mr. Hart will continue to live in Salt Lake City.

Dr. A. K. Snelgrove, visiting professor of geology at Rutgers university, 1945-46, has returned to his post as head of the department of geological engineering at the Michigan College of Mining and Technology, at Houghton, Mich. The latter institution granted him leave of absence to enable him to initiate a new Bureau of Mineral Research at Rutgers.

David L. Dowie has left Australia for London to take up the position of chief engineer for Bewick Moreing & Co.

Samuel H. Dolbear, president; **Reginald G. Bowman** and **Arthur S. Hecht,** representing the firm of Behre Dolbear & Company, New York City, have been on a mission in China since early August. The firm has been engaged by the National Resources Commission of China to make a detailed study of tin, tungsten, and antimony deposits and the corresponding industries of China.

J. D. Lennox, manager of the Rose Deep, on the Rand, has resigned and retired from the mining industry. His position has been filled by **C. J. Irving,** transferred from Geldenhuis Deep.

Edward H. Wisser, consulting geologist, San Francisco, Calif., has been appointed lecturer in the division of mining and metallurgy, University of California, Berkeley, Calif. He will lecture on the principles of mining.

Clarence O. Mittendorf has been appointed chief of the non-ferrous metals and mining section of the Office of Price Administration, succeeding **Warren M. Huff,** who has resigned to join the Kaiser-Frazer Corporation as head of steel purchasing.

Dr. A. B. Kinzel, vice president of Union Carbide & Carbon Research Laboratories, Inc., and of the Electro Metallurgical Co., has been appointed chairman for the coming year of The Engineering Foundation. He will represent the Foundation on the executive board of the National Research Council.

L. G. White, previously employed by Cuyuni Goldfields, Ltd., and Bralorne Mines, Ltd., has been appointed manager of Brown McDade Gold Mines, Ltd.

J. F. Myers, mill superintendent of the Tennessee Copper Co., attended the annual Western meeting of the Canadian Institute of Mining and Metallurgy held in Vancouver, B. C., Nov. 13, 14, and 15 and presented a paper at the symposium on classification and screening.

Dr. Howard T. James, managing director of Pioneer Gold Mines of B. C., Ltd., has returned to British Columbia after an inspection of properties in Fiji.

F. Stewart Morgan is making a survey of British Columbia mining operations on behalf of Production Management Engineering Associates, San Francisco consultants in efficiency engineering.

Charles Arthur Banks, a mining engineer long associated with prominent gold-mining developments, has been appointed Lieutenant-Governor of British Columbia.

Margaret Renwick, formerly with the U. S. Bureau of Mines at Platteville, Wis., is now employed as engineer at the plant of the Inland Lead & Zinc Co., Livingston, Wis.

Leland A. ("Shorty") Walker, manager for Utah mines of the U. S. Smelting, Refining & Mining Co., retired on Nov. 1 under the company's retiring plan.

Dr. B. H. Moore, who recently retired from the position of director of the School of Mines, Kalgoorlie, Western Australia, is now consulting metallurgist to Evanston Gold, N. L., in that State.

Charles E. Marlatt has been appointed superintendent of property for the Consolidated Mining & Smelting Company of Canada, Ltd. **John B. Baker** has succeeded **Marlatt** as safety engineer.

A. A. Lee, formerly associated with Hedley Mascot Gold Mines, Ltd., has been appointed mine manager of Bristol Mines (1946) Ltd.

F. D. Long, who has been manager of Brakpan Mines since 1939, has retired. He is succeeded by **N. G. Harper,** who has been manager of South African Land & Exploration Co. Harper's successor as manager of "Sallies" is **H. M. Forrest.**

James H. Cazier is again connected with the mining activities of the RFC with offices in Phoenix, Ariz. He has recently returned after serving with the Navy.

Alfred T. Barr has been appointed mine superintendent of the New Cornelia Branch of Phelps Dodge, succeeding **H. H. Angst,** who has retired at the age of 65. Mr. and Mrs. Angst will now make their residence in California. **John A. Lentz, Jr.,** has been appointed chief engineer of the New Cornelia Branch. He has been

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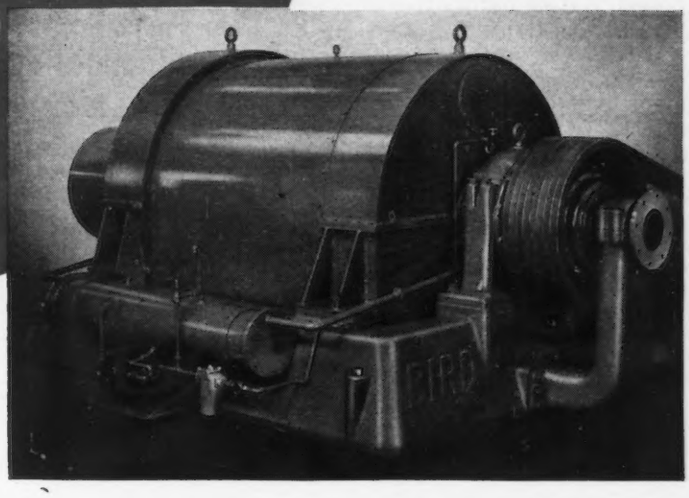

The Bird Centrifugal Classifier whisks away the slimes as clean as a whistle. It effects separations as fine as 2 microns on a big tonnage basis. It has reduced reagent expense as much as 60% without sacrificing yield.

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The BIRD Centrifugal CLASSIFIER

serving as engineer for the firm for the past five years.

Charles E. Blackett has resigned from the position of general manager of New Occidental Gold Mines, N. L., Cobar, South Wales, to establish a consulting practice in Melbourne, Victoria. **Frank H. Beggs** who was assistant manager at New Occidental Gold Mines, N. L., Cobar, has been appointed general manager.

P. H. Ozanne, chemist in the assay laboratory of the Phelps Dodge Corporation since 1917, retired on Oct. 1 last.

Harry M. Lavender, of the Phelps Dodge Corporation, has been elected to the board of governors of the Western Division of the American Mining Congress. Others elected from Arizona were **Robert Hughes** and **Charles Willis.**

R. J. Agnew, who was general manager in Western Australia for Gold Fields Australian Development Co., Ltd., has returned to London.

OBITUARIES

A. C. Oberg, consulting mining engineer and Iron Country mine operator, died recently at Duluth, Minn.

Dr. Leroy Upson Gardner, a pioneer in silicosis research in relation to the treatment of tuberculosis, died at Saranac Lake, N. Y., on Oct. 24, of a heart ailment, at the age of 57. Dr. Gardner served in World War I in the Medical Corps of the Army and had been an instructor in pathology at Harvard and Yale before becoming associated with the Trudeau Foundation at Saranac Lake, N. Y., in 1919.

Thomas Morrison, 84, a director of The International Nickel Company of Canada, Ltd., and a former director of United States Steel Corporation, died at Spring Lake, N. J., Oct. 26. He was a cousin of Andrew Carnegie, and had been associated with him in the steel industry.

C. L. Butlin, consulting engineer to the Central Mining & Investment Corporation on the Rand for ten years, until his retirement on Jan. 31 this year, died recently in South Africa. He started his service with the group as a sampler on the New Heriot mine in 1904, was manager of the Modder "B" for 22 years and president of the Association of Mine Managers of the Transvaal in 1931.

Johannes van den Broek, a leader in the tin industry and president of the Billiton Co., died at The Hague on Oct. 22, age 64. In 1931, he took an active part in the establishment of the International Tin Committee and served as its chairman over a period of years. Mr. van den Broek's company organized the Tin Processing Corporation to construct and operate the Government's tin smelter at Texas City, Tex.

Eric Arthur Meale, 50, for the past 28 years chief assayer at the East Helena plant of the American Smelting & Refining Co., died in Helena, Mont., on Oct. 17.

J. Hayes Campbell, 75, consulting mining and metallurgical engineer, died on Oct. 24 at University City, Mo. He retired from active mining and metallurgical engineering in 1926.

Joseph M. Bidwell, 83, general manager of American Smelting & Refining Co. in Utah until his retirement in 1929, died on Oct. 31 in Salt Lake City.

Gerald F. Loughlin, 66, consultant to the director of the U. S. Geological Survey, Washington, D. C., who had written many articles on Utah ore deposits, died Oct. 22 at Washington, D. C.

George William Clark, 80, pioneer developer of mines at Ophir and Mercur, Utah, died Oct. 26 in Salt Lake City.

With Lodes of Sediment

By E. M. Huebner

Once upon a time there was a beautiful platinum blonde named Opal who was studying geology. After going out with a wulfenite for some time, she complained:

"Mineral alike. Emery would give you the chert off his back, but he has such a carbonate apatite that all the fool's gold is spent in rolling out the beryl. And when Peat took me to the Cinnabar and bort me only a pitchblende of sal ammoniac and lime, I said damourite!—He'll never see this galactite on that!

"I wish I'd meet a gneiss geyerite now. I like a datolite, but I will not go out with another wulftonite and listen to a lot of soft soapstone."

Then she met a sight for sore cat's-eyes, Jasper Flint, a magnetic pyrite with coal-black hair and eyes like jet, the most eligible batchelorite in Bathvillite. But his heart seemed nothing but a bloodstone, for he never gave Opal a bismuth glance.

She almost went into a frenzelite!

Said Opal to herself, "It isn't as if I'm a dog-tooth spar or a crossite old fossil. Through no fault of mine I shale have to act boulder and try to tantalite him into noticing me on the next field trip."

At last, to her dahllite, he invited her to see "Arsenic and Old Leucite." Opal granite him her company, her hartite with joy.

He said, "Shall I comptonite around eight?"

Opal told him that would be oölite.

But alas!—time passed and Jasper did not appear. When he finally arrived, he boracite of hyacinths and heliotropes wrapped in allophane, which he had allowed to witherite up and diposide down.

He was petrified by the variscite of her anger.

"Slate!" she snapped.

"Only bituminous," he replied.

"I suppose now you'll talc me you went to the Black Mica to biotite from Gravel Gertie," sneered Opal with a sardonyx smile on her ruby lips.

"Don't be silica," he protested. "I was merely visiting some pebbles I know."

"You mica least apologize, you cadmium," Opal quavered.

"I zinc you're schist jealous, mispickel-puss," Jasper retorted.

"I thought you were asbestos any man I ever met," she sobbed, "and now I find you're nothing but a pariscite who loves 'em and gypsum."

At that he feldspar-y to see her sulphur so. Stilbite-ing his tungsten, he knew that at the calcite of her eyes to which rose-quartz of tears his tensile strength wasn't worth a nickel.

"Ah, my little gold nugget, you are so radium when you are angry," said Jasper, actinolite he wanted to iron out this distressing epidote and looking into her azurite eyes.

He saw a deweylite aluminum—so he decided now was the time to copper.

"I lava you," he told her, placing a smaltite diamond ring on her finger.

"My nitrogen in shining armor," she murmured, "iodide ore committed souesite if I'd had to give up hopeite ever have priorite on your affection."

"Can you cookeite?" Jasper asked. "Can you bake a pyrite?"

Opal nodded.

"Then I'll tellurite now," said he, "I cannot bear topaz up such a gem. Let us zippeite over to the parsonsite in the little churchite around the cornuite. We will marcasite for a home, and perhaps our unionite be blessed with some dear little childrenite."

As he felt this gorgeous galenagainst him and hold hematite, he realized that maybe grandma called it carnelian—but when your heart was sapphire, the smoke fluorite into your eyes.

LETTERS

Flotation of Australian Gold Mining Properties

The Editor:

In the May issue of E.&M.J., your Australian correspondent mentions that the Government in this country is refusing permission for the flotation of gold mining companies whose capital exceeds £10,000 A. This is not quite in accordance with facts. Under the Capital Issues restrictions, any company whose capital is £10,000 A or less can proceed to flotation without permission from the Federal Government. Where the capital exceeds £10,000 A, Government permission is required. I know for a fact that at present and within the last eight months, no gold mining company has applied for this permission. There-

For rock bottom trolley costs

. . . Put these Mine-Tested Engineering extras of O-B type-L shoes to work on your locomotives

Long 3-inch contact between shoe and wire affords ample current capacity; prevents harmful arcing and wire burning.

Smooth long wearing shoe hugs the wire tightly, glides smoothly over bumps and hard spots. Dewirements are infrequent.

Trolley shoe rides wire on "dead-center", can't tilt when going either forward or backward. Patented bearing keeps pivotal center of shoe located in center-line of wearing surface.

Internal spring keeps shoe and harp assembly in proper alignment.

Designed for long life with low wire wear, Type L Trolley shoes bring current collection costs down to rock bottom.

Heavy braided copper shunt brings current direct from trolley to motor cable. No resistance, and hence no harmful heating.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

fore, a wrong impression may be created that the Federal Government has set its face against new gold companies. This is not so. Actually, the industry is just getting over the war and no Australian company is ready to launch out on new projects. Several of the British companies in W.A., however, have secured the permission of the British Treasury to increase their capital after official interchanges between England and Australia.

J. H. LAURENCE

Perth, West Australia

We checked with our correspondent in regard to the above statement. He states, under date of Sept. 13, "I have had this matter rechecked, and have contacted a number of mining companies and mining associations. It is correct to say that permission has not been given by the Commonwealth Government for the flotation of gold mining companies exceeding £A10,000. It is further correct to say that there are many companies in Australia awaiting an opportunity to obtain additional capital for the expansion of the industry. Further, there are many properties for which formation of an operating company is being delayed because of this restriction."

However, under date of Sept. 10, Mr. Laurence refers to a conference between state premiers and the Commonwealth Government in which the Prime Minister voiced his sympathy with the proposal of the Premier of West Australia that encouragement should be given to gold mining companies and gold mine finance. Apparently, the situation is that Commonwealth policy has hampered gold mine finance, but shows some signs of softening—EDITOR.

The Mining Industry From a Student's Viewpoint

The Editor:

Periodically, it seems, United States mining publications carry complaints about the small number of students enrolled in mining courses in colleges, or about the caliber of the students and graduates. Editors, professors, mine operators and others have had their side printed. The following are the thoughts and opinions of one student. They are not written with animosity nor bitterness:

For many years I have wanted to study mining and mining geology. Night school and correspondence courses made up college entrance requirements which had not been taken in high school. Marriage, a child, and the war delayed my college work, but finally last year I enrolled in one of our Western mining schools.

Housing was a problem in the little town, so married couples with children lived in one of the dormitories. By this spring the influx of single students and expansion of school departments necessitated our vacating the dormitory. Government housing was made available for veterans and their families. Not being a veteran, I had to return to the West Coast with my family. Now I am at a large university where no mining is taught. I will finish as a geology major and take my mining somewhere else as graduate work.

The semester at Mines was, however, very enlightening. A check revealed that plenty of graduate scholarships were available, but no undergraduate scholarships were listed. This was a rather disconcerting discovery. Weren't mining companies interested in helping students? Was research the only item they were interested in? A little doubt as to the wisdom of his choice for a lifetime of work forms in the student's mind.

Summer vacation is only a few weeks away. The head of the mining department informs us that he is not getting much cooperation from mining companies for summer work for us. The doubt about his chosen profession increases in the student's mind when he finds out there are plenty of jobs for the summer for students majoring in metallurgy and petroleum. "Maybe I should change."

The various heads of the departments meet with the student body and discuss the field of their choice; the past, present, and future possibilities and pay. Mining comes out at the bottom of the list on all points discussed. The doubt crystallizes into certainty, and the student changes his major. Mining loses another prospective engineer.

You who read this will probably say one of two things, "So what?" or "What can I do about it?"

Many things can be done. Undergraduate scholarships in mining and mining geology would not only be of help to the needy student, but would furnish concrete evidence that the mining industry wants and needs new blood and is willing to help get it. Such a policy would also unquestionably bring the field to the attention of students who would not otherwise hear of it.

Summer work is just as much a part of a student's education as classroom work. It is only by actually working underground, above ground, and in the plant that the student finds out if he is fitted for the duties required. He learns to work with the type of men he must work with in the future. He becomes accustomed to the kind of surroundings he will work in for the major part of his life.

There is a complaint that graduates do not know what they should or as much as they should. Possibly that is true, but what have you done to correct the situation? How often do you go to a mining school for a week to check on what is being taught, how it is being taught, material used, equipment used? A great deal of equipment becomes outmoded over a period of years. How much new equipment have you helped an under-endowed mining school procure? Do you know if the student is being taught the basic fundamentals of labor relations? Does he obtain a fairly clear idea of how to combat political moves which endanger the mining industry? Does he actually know mining's place in the complete industrial structure of our civilization? He should know these things and you should see that he is taught them.

Top ranking men in industry, education, and politics always give graduation speeches, but how often have you gone out of your way a few miles and a few hours to give a welcoming talk to incoming freshmen majoring in mining? Giving the beginning student a proper send-off is more important than a speech to graduating students.

Pay and living conditions are always of prime importance. Most graduate engineers do not expect to start at the top nor do they expect to be paid less than a workman who belongs to organized labor. Remember that the graduate has spent at least four years in study and several thousands of dollars in an effort to improve his earning capacity and does not expect to work and wait another four years to get a decent wage. It was of interest to me to find out from a leading mining engineer that out of his class of twenty or more graduates in mining only four were still in the mining business. That is not a very good record and does not speak well for the mining game.

The daily newspapers and popular magazines seldom carry any good publicity for mining. Strikes and disasters make the headlines. Nearly every other major industry sees to it that publicity is in the affirmative if by no other means than advertising. Except for a recent series by De Beers on diamonds I do not recall seeing primary mining in any publication that can be termed popular. This is not good, as very often students choose their major study on the basis of what they are familiar with and what they feel most acquainted with. Chemistry, petroleum, radio, aviation, and other industries keep themselves in the public eye.

The basic mining industry should once more endeavor to get its name into the household vocabulary of the majority of the people. A continuous and informative campaign will make people realize that mining is an essential part of their way of life and not just something that was done in California in 1849 and written about in books, or a romantic episode in the history of the Yukon back in '98, and recorded for posterity in the poems of Robert Service.

PAUL E. HUNT

Hollywood, Calif.

News of Industry

(*Continued from page* 88)

countries. Three places on this board have been left vacant to allow inclusion of countries, such as the U.S.S.R., which were not represented at the September meeting.

America's temporary representative on the executive board is Fenton B. Turck, member of the joint committee on international relations of the Engineers Joint Council of the United States. Other countries represented on the board are Great Britain, France, Switzerland, Czechoslovakia, China, India, Egypt and Poland.

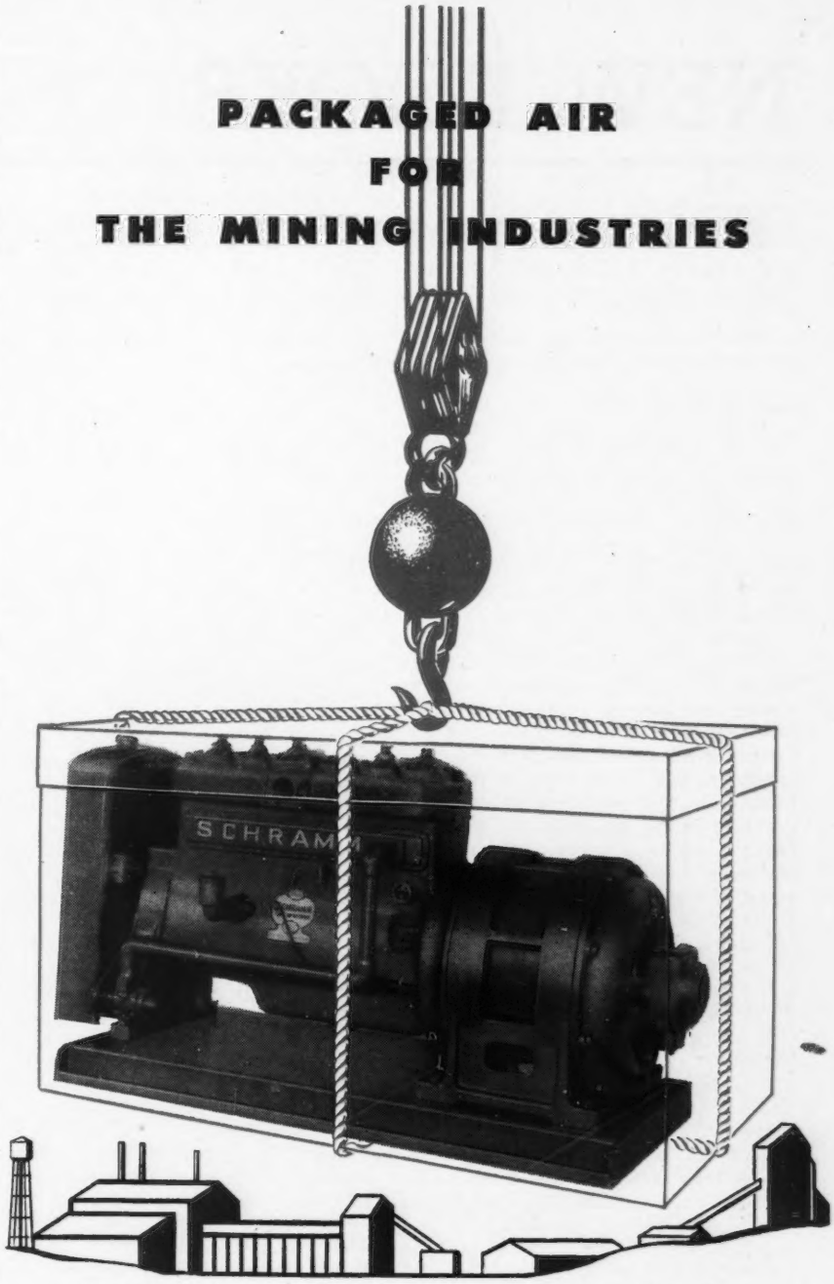
Of chief interest to mining engineers, apart from some discussion of the special qualities needed for work in colonial lands, was the paper presented by P. Legoux, chief of the Mines Service of the French Colonial Ministry, on the problems of mechanization facing mining in French possessions. In general, the colonial mines suffer from a relative shortage of native labor, and the need of paying wages higher than previously. This tends toward mechanization, wherever practicable, according to M. Legoux. The chief recent mechanization program cited is that now in progress at the nickel mines in New Caledonia.

Mining in nearly all French colonial possessions outside Indo-China is open-cut, and much of it is alluvial. In this field mechanization is often stymied by lack of a regular water supply. Exploitation has been directed toward rich deposits in small streams which could be worked by hand.

The American delegation consisted of: Col. C. E. Davies, secretary of the American Society of Mechanical Engineers; H. R. Harris, vice president and general manager, American Overseas Airways; Fenton B. Turck, president of Turck-Hill & Co.; E. R. Purves, public and professional relations director of the American Institute of Architects; Morris L. Cooke, consulting engineer; William J. Hargest, McGraw-Hill Publishing Co; Dr. E. Linton Grinter, dean, Illinois Institute of Technology; Dr. F. B. Farquharson, director of the Engineering Experiment Station, University of Washington, Seattle; Hugh L. Dryden, assistant director, U. S. Bureau of Standards; Professors Smith and Salvadori, Columbia University; Dr. F. J. Malina, California Institute of Technology; Dr. E. S. Lee, general engineering and consulting laboratory, General Electric Co.; L. A. March and W. F. Skeats, General Electric Co; W. G. Friedrich; and Col. T. A. Weyher, Major D. G. Spear, and Major P. O. Langguth, of the U. S. Army.

Twenty American reports were presented. These and others will be available, as long as they last, from the secretariat of the new International Engineering Conference, 86 bis, Boulevard de la Tour-Maubourg, Paris 7; also from The Engineers Joint Council, 29 West 39th St., New York, N. Y.

PACKAGED AIR
FOR
THE MINING INDUSTRIES



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NEW BOOKS

GEOLOGY APPLIED TO SELENOLOGY. By J. E. Spurr. Science Press Printing Co., Lancaster, Pa. Pp. 318. Second Printing, 1945. Price $5.

Taking a large photo of the moon, the author has applied his long experience in geological interpretation to a study of moon surface features and their origin. He finds lunar phenomena explicable thus, and concludes that they are "the record and the result of the crusting over of a fluid sphere, the last stages of which were quieted untold ages ago." The selenological details which the author has deduced are quite amazing and make fascinating reading to the geologically informed. Many of the principles established probably apply to stages of earth history the record of which has been obscured by subsequent events. For example, the author concludes that the Mare Imbrium is a topographically low, basaltic area because it was once pushed out as a gigantic bulge by gases differentiating out under a primeval crust. This eminence encouraged the draining away of the fluid or viscous siliceous outer crust. Thus, when the escape of underlying gas permitted subsidence of the bulge, isostatic adjustment resulted in a depressed area. Spurr suggests that a similar process may account for continents and ocean basins on earth.

E. J.

THE INDUSTRIAL REPUBLIC. By P. W. Litchfield, chairman of the board, Goodyear Tire & Rubber Co., Corday & Gross Co., Cleveland, Ohio, Pp. 224. Price, $4.

When "The Industrial Republic" was first published, in 1919, Mr. Litchfield was promptly criticized by some short-sighted contemporary industrialists as being pro-labor and radical because of his frank analysis of the shortcomings of labor and management, and the liberal reforms he then suggested. Democratization of industry was a major recommendation.

As if to say, "I told you so," the 1919 text is repeated in the first part of the current volume, following which Mr. Litchfield relates the formation and successful reign of a truly democratic industrial assembly within the Goodyear plant. Workers and foreman elected representatives to a "house" and "senate," which worked jointly for 16 years to bring about changes in factory rules, desirable wage adjustments, better working conditions, and grievance adjustments without infringing upon the legal duties and functions of managements.

But this happy arrangement was beaten to extinction by blows from many quarters including communist groups who precipitated strikes, national unions emerging from the incipient stage, and the National Labor Relations Board. To this unfortunate development, the author charitably concludes, "Allowance should be made for the tension of the period and for the excitement of the crowd psychology".

Intermittent strikes and strife under the CIO union followed, even through the years of World War II. Viewing these unsatisfactory conditions in our democracy, Mr. Litchfield weighs the alternative communistic and dictatorship systems, and finds their liberty-throttling methods completely distasteful. The book concludes with an appeal for a real industrial republic offering greater freedom and rewards than under any other system. The formula is a proper appraisal of the obligations and rights of labor, management, and in particular more attention to the often-forgotten, long-suffering public whose cause Mr. Litchfield so ably champions.

A. W. K.

STANDARD METAL DIRECTORY. Published by the Atlas Publishing Co., New York, N. Y. Pp. 852. Price $10.

The 1946 edition, a revision of the issue published in 1943, has been expanded to embrace the numerous changes that have taken place in the metals field during the war years. Listings include iron and steel plants, ferrous and non-ferrous foundries, rolling mills and fabricating plants, and primary and secondary smelters and refiners of non-ferrous metals. It is a handy reference book for purchasing agents and sales departments.

CANADIAN MINES HANDBOOK 1946. Northern Miner Press, Ltd., 122 Richmond St. West, Toronto, Canada. Pp. 404. Price $1.

The 1946 edition of the *Northern Miner's* always valuable compilation of Canadian mining companies provides some interesting points of comparison with the handbooks of recent wartime years. The first part, devoted to producing and developing mines, lists 1,765 active companies, compared with 1,300 in 1945 and the low total of 554 in 1943. Despite this indicated surge in activity, the handbook's editors note that some 400 mining companies incorporated during the year were unable to finance beyond the initial organizing stage. It is found that thirty million dollars held in the treasuries of new companies a year ago has shrunk by one-third. This situation reflects in part the cutback in gold price in July following adjustment of the Canadian dollar to parity. As a corollary, however, the large, well-established mining organizations, freed from the competition of promoters in acquiring holdings, have recorded an exceptionally high level of activity in the exploration and development of new properties. Quebec again led other areas in volume of new exploration, but Yellowknife's booming activity placed it a close second.

The usual summary of pertinent data is given under each listing, including names of officers and directors, history, capitalization, property holdings, mine development, production, ore reserves, and balance sheets. Part two of the handbook lists more than 5,000 inactive, dormant, or defunct companies, with brief analyses. Supplementary tables give the range of mining share prices on the Toronto Stock Exchange from 1939 to the middle of 1946, together with schedules of brokers' commission rates and Government transfer taxes.

T. L. W.

PUBLICATIONS RECEIVED

"Iron Ore Preparation in Germany." Reported by members of B.I.O.S. Trip No. 1234, November 1945. Prepared by British Intelligence Objectives Sub-Committee, 32 Bryanston Square, London, W.1, England. Price 2s.6d.net. Seven plants were visited. The 20-pp. report covers crushing and screening; wet concentration plant; magnetic concentration (Reichswerke A.G.-Herman Goering); sintering; nodulising; briquetting; and Krupp Renn process.

Turkey, Geological Map. The geology of Turkey's entire area has been mapped in colors in six sheets or quadrangles, each being 29¾ in. wide and 21¾ in. high, including the legend and title. The scale is 20 km. to 1 in. The sheets are arranged in two west-east tiers or rows, one above the other. The four sheets in the northern tier, beginning at the Aegean Sea on the west, are designated thus: I, Istanbul (Constantinople). II, Ankara. III, Sivas. IV, Ergurum. The foregoing tier includes the Black Sea coast. The lower tier of sheets, again beginning with the Aegaean on the west, comprises: V, Izmir (Smyrna). VI, Konya. VII, Malatya. VIII, Musul. The latter tier includes the Mediterranean coast.

These sheets have been published by MTA, or "Maden Tetkik ve Arama," the Bureau of Mining Investigation and Research, at Ankara, the capital. Lettering on the map is in Turkish. A translation of the legend in each case is given in separate explanatory notes, in French.

Barium Minerals in England and Wales. Wartime Pamphlet 46, Geological Survey of Great Britain. Geological Survey and Museum, South Kensington, S.W. 7, England. Pp. 150. Price 6s. 9d.

The Journal of Leeds University Mining Society, Leeds, England. The seven articles include one on "The Occupational Diseases of Miners," by D. G. Robinson, and one on "Methods of Measuring Tensile Stresses in Vertical Winding Ropes," by J. L. Kerry and H. Hitchen. The latter finds that the actual tension in a hoisting rope near the sheave can be measured by inserting a micro-tensiometer in the system; also that the tension at the capel and at the sheave can be determined by installing a decelerometer on the cage.

"The German Zinc Smelting Industry." Final report No. 379, Item No. 21, issued by British Intelligence Objectives Sub-Committee, 32 Bryanston Square, London, W.1, England. Pp. 170. The following plants are covered: Unterharzer Berg und Hüttenwerke; Berzelius Metallhütten; A. G. Zinkindustrie W. Grillo; A. G. des Altenbergs; Stolberger Zink (Nievenheim); Stolberger Zink (Munsterbusch); Metallwerke Unterweser.

"Geology of Messina Copper Mines and Surrounding Country." By P. M. Söhnge. Geological Survey, Pretoria, Union of South Africa. Pp. 280, plus 22 separate plates. Price £1, 1s.

Geology and Ground-Water Resources of Coastal Plain of East-Central Georgia. Published by Georgia Department of Mines, Mining and Geology, Atlanta, Ga. (Garland Peyton, Director) in cooperation with U. S. Geological Survey. Pp. 173.

"Geology of the Coastal Plain of East-Central Georgia." By P. E. Lamoreaux (U.S.G.S.). Bulletin 50, Part I. Published by Department of Mines, Mining and Geology, Atlanta, Ga., in cooperation with U. S. Geological Survey. Pp. 26.

Directory of Georgia Mineral Producers, 1946. Department of Mines, Mining and Geology (Garland Peyton, Director), Atlanta, Ga. Pp. 29.

"The First Hundred Years of the Smithsonian Institution, 1846-1946." By Webster P. True, Chief of Editorial Division of the Institution. Pp. 64.

Manner of Locating and Holding Mineral Claims in California. By A. H. Ricketts. Revised by C. A. Logan, July 1946. State Division of Mines, Ferry Building, San Francisco. Pp. 35. Price 25¢.

Application of Shaped Explosive Charges to Mining Operations: Tests on Steel and Rock. By Robert S. Lewis and George B. Clark. Bulletin 1, Department of Mining Engineering, University of Utah, Salt Lake City, Utah. Pp. 48. Price $1.25.

Mica Deposits of Petaca District, Rio Arriba County, New Mexico. (Prepared by U. S. Geological Survey.) New Mexico Bureau of Mines and Mineral Resources, Socorro, N. M. Pp. 294, plus maps and plates.

Mascot-Jefferson City Zinc Mining District, Tennessee, Geologic Map and Structure Sections. By Josiah Bridge, 1945. Scale 2 in. equals 1 mile. (The base is from topographic maps made by U. S. Geological Survey and Tennessee Valley Authority).

"The Aluminum Industry." By Stanley V. Malcuit, Public Relations Department, Aluminum Co. of America, Pittsburgh, Pa. Published by Bellman Publishing Co., Inc., Boston, Mass. Pp. 36. Price $1.

St. Louis County, Minn., Annual Report of Inspector of Mines, 1945. (Covers the larger part of the Mesabi Range). A. F. Benson, Inspector of Mines, Court House, Virginia, Minn.

Michigan. Report of Mine Inspector of Iron County (William Melchiori, Stambaugh, Mich.) for period Sept. 1, 1945, to Aug. 31, 1946. Pp. 17.

South Dakota. Annual Report of Inspector of Mines 1944. Francis Church Lincoln, Inspector, Lead, South Dakota. Pp. 34.

The following bulletins issued by the U. S. Geological Survey are sold by the Superintendent of Documents, Washington, D. C. The price is given in each case.

"Geology and Associated Mineral Deposits of Some Ultrabasic Rock Bodies in Southeastern Alaska." Bulletin 947-D. Pp. 65-84. Price 10¢.

"Nickel Investigations in Southeastern Alaska." Bulletin 947-C. Pp. 39-64. Price 15¢.

"Copper Deposits of Nizina District, Alaska." Bulletin 947-F. Pp. 93-120. Price 15¢.

Bulletin 945-G. "Chromite Deposits of North Elder Creek Area, Tehama County, California." Pp. 191-210, plus maps. Price not given.

Bulletin 946-E. "San Jose Antimony Mines Near Wadley, San Luis Potosi, Mexico." Prepared in cooperation with Department of National Economy and other governmental bodies in Mexico. Pp. 131-153, plus maps. Price 40¢.

Bulletin 947-B. "Molybdenite Investigations in Southeastern Alaska." Pp. 38, plus maps. No price given.

Bulletin 947-G. "Copper Deposits of the Kotsin-Kuskulana District, Alaska." Pp. 121-141, plus maps.

Hollidaysburg - Huntingdon Folio (Pennsylvania) of Geologic Atlas of United States. By Charles Butts. Folio 227, 18¼ in. wide by 21¾ in. high. Text pages 20, plus 8 quadrangle sheets and a columnar section; also three sheets of halftone illustrations.

The following Reports of Investigations and Information Circulars have been issued by the Bureau of Mines, Washington, D. C. No charge is made:

R.I. 3853. "Examination of the Wah Wah Lead-Zinc Mine, Beaver County, Utah." Pp. 14.

R.I. 3854. "Exploration of Gallinas Fluorspar Deposits, Lincoln County, N. M." Pp. 25.

R.I. 3856. "Exploration of Stiner and Bunch Hollow Zinc Properties, Powell River Area, Union and Claiborne Counties, Tennessee." Pp. 4.

R.I. 3857. "Exploration of the Mecklenburg County, Va., Tungsten Area." Pp. 5.

R.I. 3858. "Exploration of the Piedmont Manganese Belt, McCormick County, South Carolina, and Wilkes County, Georgia." Pp. 5.

R.I. 3861. "Diamond Drilling of Potash Reserves in Eddy County, N. M." Pp. 11.

R.I. 3865. "Investigation of the Miami-West Palm Beach Belt of Silica Sand in Florida." Pp. 5.

R.I. 3873. "Exploration at the Cline Mine, Cabarrus County, N. C." Pp. 4.

R.I. 3876. "Survey of Tin in California." Pp. 14.

R.I. 3877. "Exploration of the Bear Lodge Fluorite Property, Crook County, Wyo." Pp. 7.

R.I. 3878. "Exploration of Eagle Mountain Fluorspar Deposits, Hudspeth County, Tex." Pp. 11.

R.I. 3884. "Exploration of the Big Four Zinc-Silver Mine, Summit County, Colo." Pp. 7.

R.I. 3885. "Exploration of Red Mountain Chromite Deposits, Kenai Peninsula, Alaska." Pp. 26.

R.I. 3886. "Small-Scale Tests of Selective Reduction of Iron in Titaniferous Iron Ores." Pp. 19.

R.I. 3887. "Observations on the Use of a Diesel Freight Locomotive Through a Railway Tunnel." Pp. 20.

R.I. 3888. "Routine Quantitative Analysis by X-ray Diffraction. (1) Photometric Procedure. (2) Analytical Method." Pp. 10.

R.I. 3889. "A Study of Fault Determinations by Geophysical Methods in the Fluorspar Areas of Western Kentucky." Pp. 27.

R.I. 3892. "Studies on the Flotation of Spodumene From the Edison Mine, Keystone, South Dakota." Pp. 8.

R.I. 3893. "Concentration of Fluorite From Metals Reserve Company Stockpiles." Pp. 13.

R.I. 3896. "Exploration of the El Dorado Copper Mine, El Dorado County, Calif." Pp. 5.

EQUIPMENT NEWS

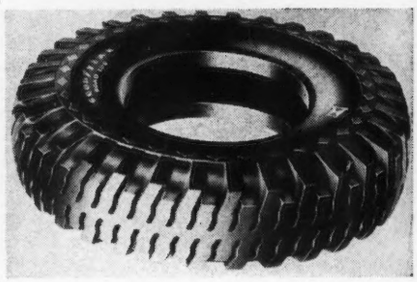
CLAMSHELL BUCKET-TYPE BOTTOM-DUMP WAGON, Model D-P2-16, manufactured by Dixon Wagon, Inc., 2801 West Mission Road, Alhambra, Calif., has a capacity of 16.2 cu.yd., struck measure, and 20 cu.yd. with heaped load. Buckets open to an area of 6x10 ft., and tires are outside the dump spread. Dumping is controlled by a ½-in. cable on a single-drum unit powered from truck transmission.

Alarm System

A new signaling assembly, the "Air-O-Larm," is announced by the Brown Instrument Co., Philadelphia, Pa. It will sound an alarm in the event of excessive flow, pressure, temperature, or other abnormal conditions existing in industrial processing. The system may be applied to produce audible or visible warning signals.

Road Lug Tires

A new Road Lug line of off-the-road tires suitable for strip mining and rough duty is announced by The Goodyear Tire & Rubber Co., Akron, Ohio. The tires are constructed with a rayon-cord carcass, tread, and sidewalls with natural rubber content equal to prewar content and extra heavy layers of cushion rubber between plies. All sizes have high-carbon steel-wire multiple beads. See below.

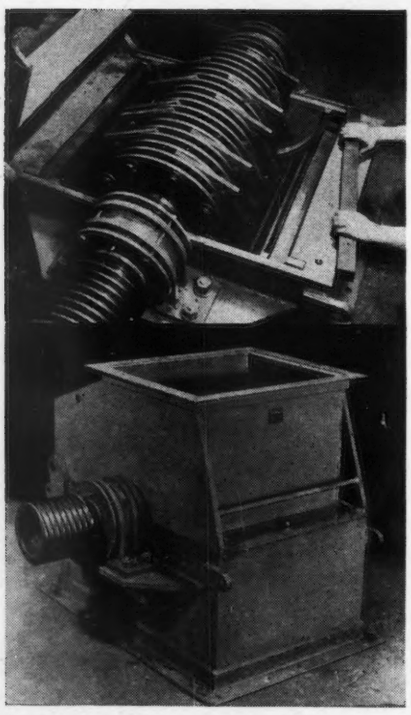


All-Steel Motor

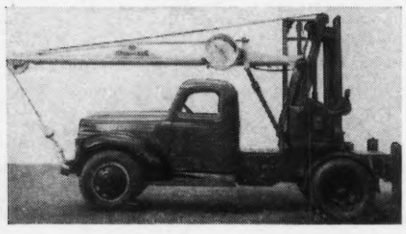
A new all-steel ac. electric motor known as the "Life-Line" type, which is more than 35 percent smaller than its predecessor, is announced by Westinghouse Electric Corporation, Buffalo, N. Y. Starting torques are increased as much as 134 percent per pound of motor weight, and maximum torques, 116 percent per pound. Steel replaces the more conventional cast-iron construction. The motor is adequately corrosion proof. Prelubricated ball bearings will require no further lubrication for five years after installation. Several types of motors are designed to permit interchangeability of parts.

Hydro-Crane

A simple high-capacity hydraulic system operates the boom, hoist, swing, and even a clamshell bucket if desired on this new truck crane announced by the Milwaukee Hydraulics Corporation. Hydraulic outriggers can be extended or retracted horizontally and vertically for stabilization in three to five seconds.



NEW HEAVY-DUTY HAMMER MILL, type W-30H, has been added to the line of mills made by Buffalo Hammer Mill Corporation, Buffalo 3, N. Y. Charge opening is 24x30 in. Hardened-steel hammers revolve at 1,000 to 7,500 rpm. The mill grinds, pulverizes, or crushes a number of varieties of mineral products.



Shuttle-Car Tires

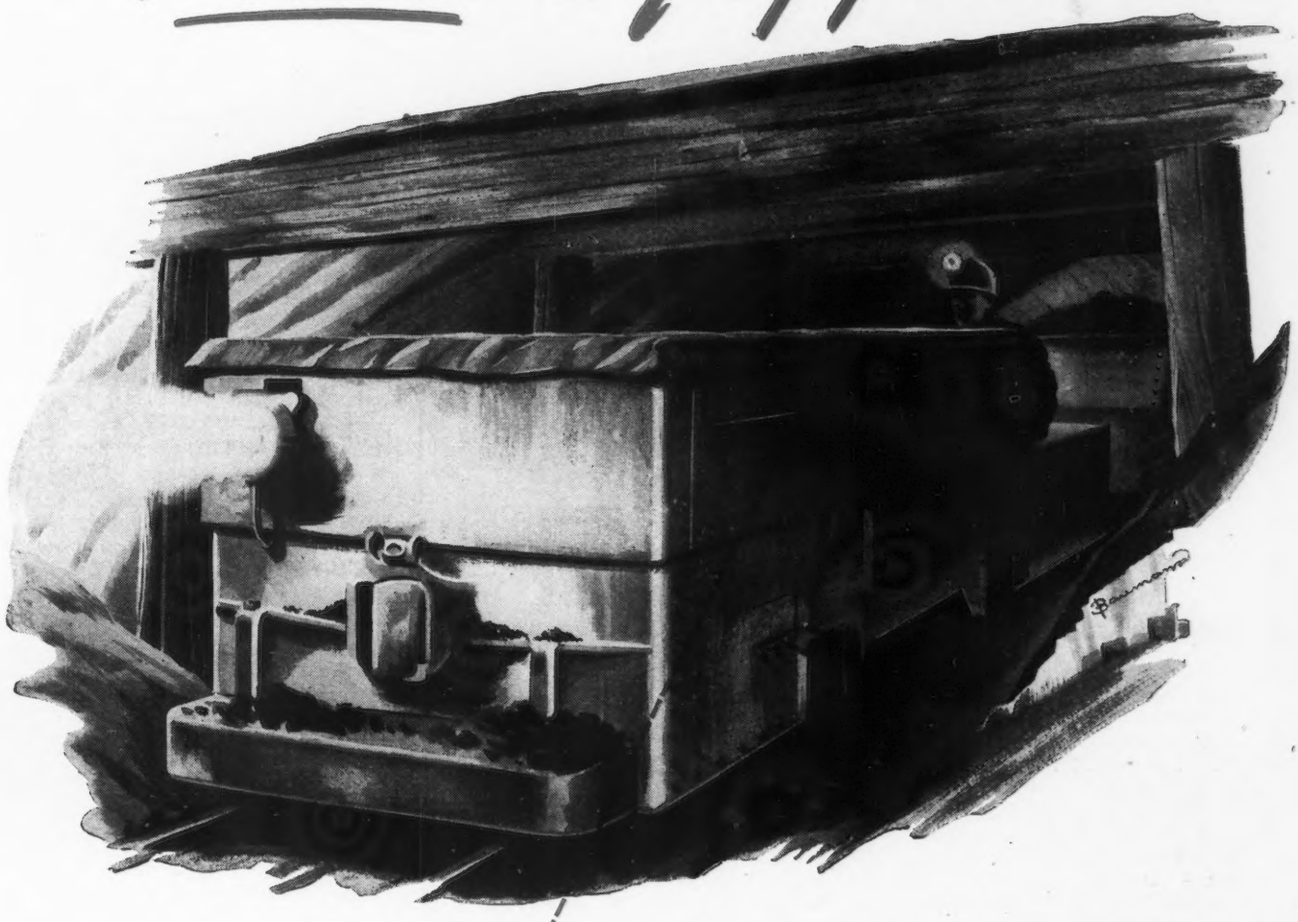
The B. F. Goodrich Co., Akron, Ohio, announces a new pneumatic tire for use on shuttle cars and other underground equipment. It is constructed with round shoulders and extra-thick sidewalls to prevent cutting, and is designed for two-way traction, which is essential for shuttle-car operation.

Photoelectric Control

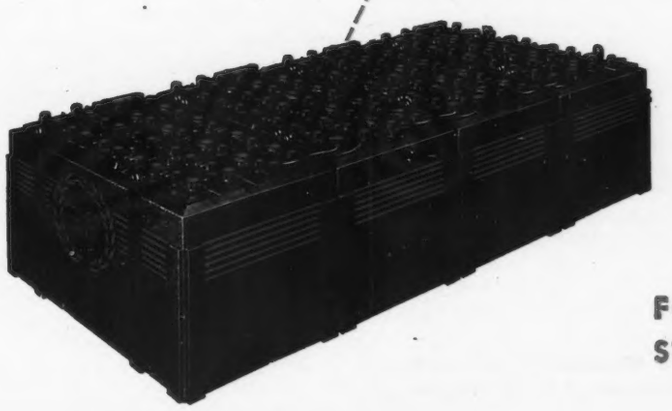
A general-purpose photoelectric control switch in various models has

DOWN GO COSTS WHEN THEY'RE

Philco Equipped



Many operators are getting more work at low cost from locomotives and other mine haulage equipment by changing to modern extra capacity* Philco Storage Batteries. This swing to Philco has gained by leaps and bounds since the introduction of the sensational new Philco "Thirty" Mine Batteries, with 30% longer life. Of course Philco "Thirty" has the modern construction that gives 10% extra capacity* with no increase in overall size. Write for a catalog of specification data today. PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey.



Modern construction...pioneered by Philco... gives 10% or more additional battery capacity.

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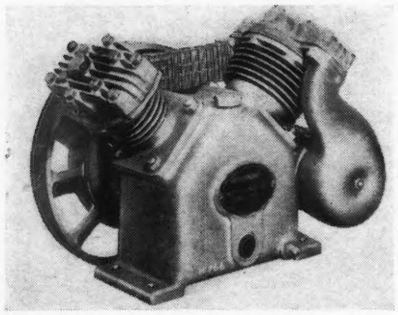
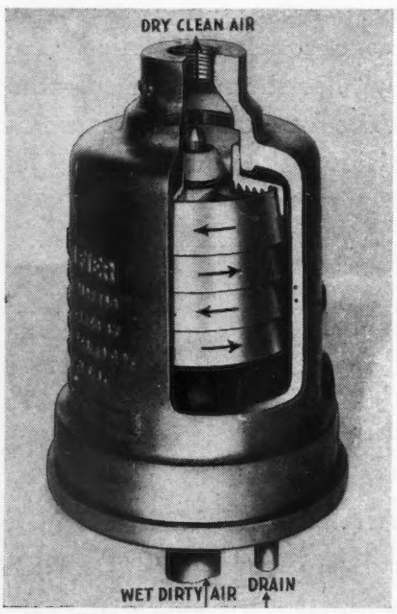


AIR KING COMPRESSOR. This is one of a new line manufactured by the Worthington Pump & Machinery Corporation, Harrison, N. J. This line includes single-stage and two-stage sizes for pressures up to 250 psi. for mating to standard motors of 1 to 15 hp.

been announced by Photoswitch, Inc., Cambridge 42, Mass. These devices, which depend on the establishment or interruption of a beam of light, have begun to find use in mining for conveyor control, as safety devices in hoisting, and in feeder operation. The manufacturer will furnish details of these new instruments.

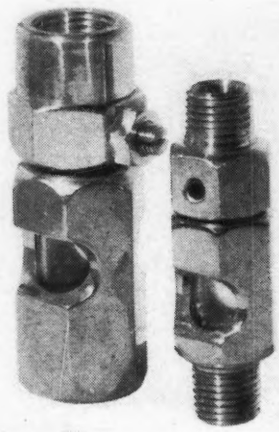
Compressed-Air Cleaner

The Aridifier removes contamination from compressed air by the centrifugal force exerted on the air as it passes upwards through four rotors. The velocity of the air revolves the rotors at high speed. Moisture, oil, and dirt become impinged on the rotors and are thrown to the housing wall, and then removed through a trap, which is emptied periodically. For further information write Logan Engineering Co., 4912 Lawrence Ave., Chicago, Ill.



Sight-Feed Valve

A new sight-feed valve for oil-circulating systems containing an unbreakable plastic sight has been announced by the Oil-Rite Corporation, 3466 South 13 St., Milwaukee 7, Wis. Oil flows past an adjustable port into the sight chamber. Settings are made with a special tamper-proof setscrew and maintained in desired position with a lockscrew. The feeds are available to fit ⅛-, ¼-, ⅜-, and ½-in. pipe threads.



INDUSTRIAL NOTES

R. G. Le Tourneau, Inc., Peoria, Ill., has moved its Eastern sales office to Washington, D. C. **O. A. Williams** is Eastern sales manager. **W. B. Worden**, formerly sales representative in South California and Arizona, has been made central sales manager for the company, with headquarters at Peoria. **Harold F. Stenstrom** is district sales representative, with headquarters at Memphis, Tenn.

James D. Greensward has been named assistant to **William C. Johnson**, vice president of the general machinery division of the **Allis-Chalmers Mfg. Co.**, Milwaukee, Wis.

A. Elton Holcomb, former division sales manager for the **Koehring Co.**, Milwaukee, Wis., died in Indianapolis, Ind., Oct. 5, at the age of 68.

B. P. Spann, formerly advertising manager of the **Gardner-Denver Co.**, has been promoted to personnel and industrial relations director. **D. P. Tunnicliff** has been appointed advertising manager.

J. A. Hill, formerly manager of the New York branch office of the **Independent Pneumatic Tool Co.**, Chicago, has been appointed manager of electric tool sales with headquarters in Chicago. **W. C. Rush**, formerly in the St. Louis branch, has been appointed manager of the newly opened Cincinnati office.

Western Machinery Co. announces the appointment of **L. T. McGuire** as manager of the Salt Lake City branch. **H. J. Mayer**, general manager of the company, who has been in charge of the branch, will return to headquarters at San Francisco.

H. B. Lilley has recently been appointed district manager of the **Timken Steel and Tube Division** of **Timken Roller Bearing Co.**, with headquarters in Houston, Tex. His territory will include Texas, Louisiana, Arkansas, Oklahoma, and Kansas.

The American Manganese Steel Division of **American Brake Shoe Co.**, Chicago Heights, Ill., announced the following appointments: **A. R. Sittig** as manager of manganese steel sales, with offices at Chicago Heights, Ill.; **E. L. Quinn** as assistant vice president in charge of welding products, with offices at Chicago Heights, Ill.; and **E. J. Nist** as assistant vice president with offices at 230 Park Ave., New York, N. Y.

L. J. Renner has been appointed **Mid-Continent Wire Rope** sales manager for **Wickwire Spencer Steel Division** of the Colorado Fuel and Iron Corporation. His division office is in Fort Worth, Texas.

G. V. Leece, vice president of **Gardner-Denver Co.**, has been appointed general sales manager for the company. Headquarters will be at Quincy, Ill.

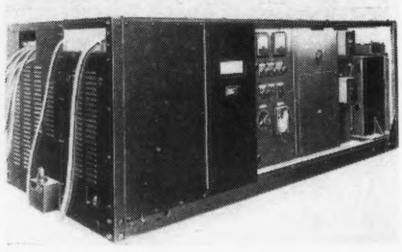
John L. Marsh is in charge of the newly opened wire and cable sales office of the **Okonite Co.** at 417 Merchants Bank Bldg., Indianapolis 4, Ind.

Leonard W. Beck has been appointed acting general sales manager of the **Cummins Engine Co., Inc.** He will continue as manager of the Central Region with offices at the factory in Columbus, Ohio.

BULLETINS

Perforated Metal Screens. Hendrick Manufacturing Co., Carbondale, Pa., has issued a new 128-page catalog, illustrating 390 shapes and sizes of openings in perforated metal. Several pages describe conveyor flights and troughs, and elevator buckets. Another section covers 100 standard de-

A REDESIGNED LINE of portable, sealed-Ignitron, mercury arc rectifiers for mining service has been announced by the General Electric Co., Schenectady, N. Y. The equipment, available in ratings of 75 to 750 kw., is a completely integrated ac. to dc. substation mounted on mine car wheels.



signs of perforated metal for construction and industrial uses. Apply for catalog on business letterhead.

Wire Ropes. Fundamental engineering data, mining applications of wire ropes, and rope selection tables are included in a useful 58-page pocket manual and catalog issued by Rochester Ropes, Culpeper, Va.

Slusher Hoists. Form 5300, issued by Ingersoll Rand Co., 11 Broadway, New York 4, N. Y., is a 54-page well-illustrated catalog of all size and types of slusher hoists. Electric and air-operated hoists are shown on location in various applications.

Earth-Moving Equipment. Power shovels, trench hoes, draglines, and cranes are presented in 36-page Bulletin No. 846 by Buckeye Traction Ditcher Co., Findlay, Ohio.

Constant-Weight Feeders. Bulletin No. 33-D issued by the Hardinge Co., Inc., York, Pa., features constant weight feeders. Volumetric feeders, disk feeders, the "electric ear," and non-flooding drum feeders are also described.

Duplex Crushing and Screening Plant. The construction and operation of the 46-VE Portable Duplex Crushing and Screening Plant with diesel and electric drives are covered in a booklet recently issued by the Pioneer Enginering Works, 1515 Central Ave., Minneapolis 13, Minn.

Safety Color Code. Safety engineers will be interested in the new 32-page booklet illustrated in full color demonstrating the advantages of using color to improve working environment. Write Finishes Division, Dept. M-6, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Rotameters. Bulletin 40-A describing completely armored, variable-area flow-rate meters for high-pressure systems may be obtained from Fischer & Porter Co., Dept. 9R-7, Hatboro, Pa.

Remote Indicating and Control Systems. Because of the increasing trend toward automatic controls in mine and milling plants, a recent Bulletin, "Direct Current Remote Indication Control Systems," will be of interest to planners and designers. Bulletin 14B6641, available from Allis-Chalmers Mfg. Co., 686 Milwaukee 1, Wis., tells how, why, and where this equipment works.

Light Inspection Cars. Light, pedal-operated "Teetor" inspection cars weighing 65 to 75 lb., for operation on mine tracks, are illustrated in a brochure issued by Light Inspection Car Works, Hagerstown, Ind.

Rock Drills. Four pamphlets illustrating and describing Blue Brute drifters, stopers, wagon drills, and hand-held drills have been issued by the Worthington Pump § Machinery Corporation, Holyoke, Mass.

Safety Goggles. A new line of Specti-Goggles is described in a folder issued by the Eastern Equipment Co., Willow Grove, Pa. A price list is attached.

Concrete Shrinkage. Engineering data pertaining to shrinkage in concrete and mortar, and methods of controlling and elimination, are subjects included in a 34-page booklet, "The Action of Embeco in Concrete and Mortars." For a free copy, write The Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio.

Electronic Controls for Pulverizers. A new folder issued by Mosher Electronic Controls, 130 W. 42 st., New York 18, N. Y., describes electronic feed controls for pulverizers, hammer mills, and similar equipment.

Flexible Shaft Machines. New additions to the "Wyco" line of flexible shaft machines, grinders, tools, and accessories are shown in a folder by Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill.

Dust Collectors. Dust-control engineering data and applications, and operating details pertaining to "Dustube" dust collectors are presented in a 50-p. illustrated catalog issued by the American Foundry Equipment Co., 345 S. Byrkit St., Mishawaka, Ind.

Pressure Blowers. A new series of corrosion resistant, axial flow, direct-drive pressure blowers with diameters up to 8 ft. and capacities up to 100,000 c.f.m. at 4-in. w.g., is described in a bulletin issued by the Moore Co., 544 Westport Road, Kansas City 2, Mo.

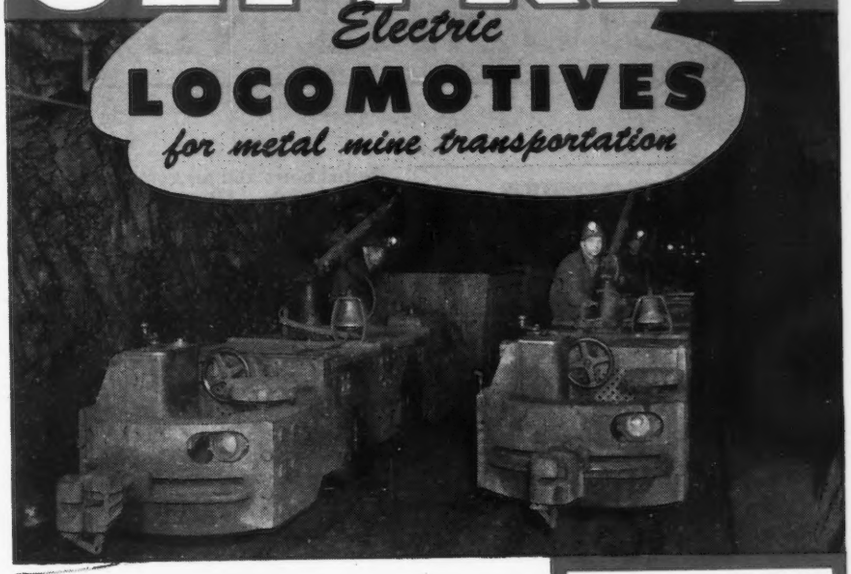
Vertical Centrifugal Pumps. A new bulletin issued by the Peerless Pump Division of Food Machinery Corporation, 301 West Ave. 26, Los Angeles 31, Calif., covers vertical centrifugal water pumps of the submerged and close-coupled types with capacities of 200 to 5,000 g.p.m. for heads from 20 to 100 ft.

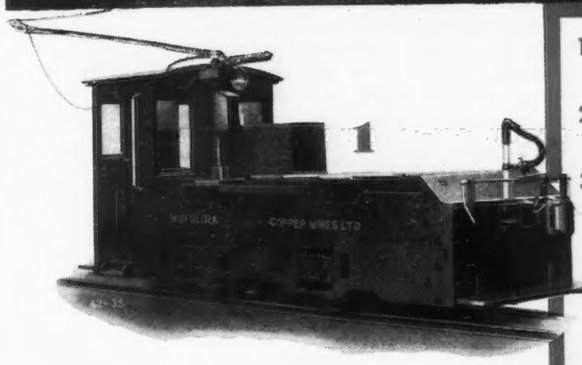
JEFFREY

Electric

LOCOMOTIVES

for metal mine transportation

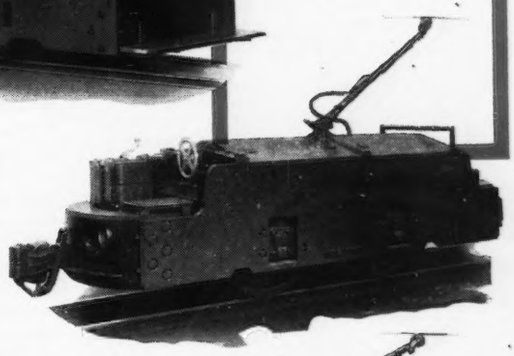




1 - 20 TON LOCOMOTIVE

2 - 6 TON LOCOMOTIVE

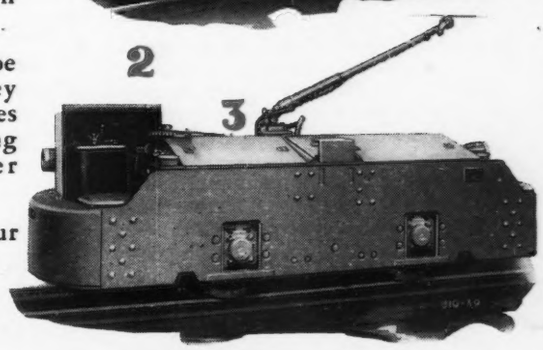
3 - 4 TON LOCOMOTIVE



● Showing two 6-ton double end control locomotives (above) with radial draw bars and special protection against water drip and splash . . . after seven years constant service in an iron ore mine.

Jeffrey locomotives can be furnished in both trolley and storage battery types to meet specific operating conditions. A few other types are shown.

Consult Jeffrey on your haulage requirements.



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Buffalo 2	Denver 2	Huntington 19	Philadelphia 3	Salt Lake City 1

REGIONAL NEWS

CALIFORNIA

Idaho Maryland operating at 800-ton rate—Production planned at Albemarle mine

★ Final returns on 1945 mineral production of California compiled by the statistical department of the Division of Mines, W. B. Tucker, State Mineralogist, indicate a total value of $437,661,591.00. The increase of $3,-87,066 over the 1944 total was due to the unprecedented output of petroleum and natural gas. Mineral substances showing the greatest annual output as to amount and value were barite, diatomite, gypsum, lithium minerals, silica (quartz and glass sand), soapstone, talc and pyrophyllite, and soda (soda ash and salt cake). Zinc registered its highest annual value.

Of the metals, an increase in annual value was recorded by gold, lead, silver, and zinc. All others showed a decline in amount and value from the previous year's record. The value of gold yield increased from $4,108,055 in 1944 to $5,177,830 (147,938 oz.) and again led all metals in point of value. Copper production was 13,949,675 lb.; lead, 14,504,767 lb.; zinc, 19,340,732 lb.; silver, 986,998 oz.; quicksilver, 21,-062 flasks; and tungsten, 71,511 units. Of the industrial non-metallic materials, the group as a whole decreased from $62,292,574 in 1944 to $59,695,-692, which was chiefly due to miscellaneous stone, the total value of which decreased from $25,138,003 to $20,-207,351.

★ Production at the gold properties of Idaho Maryland Mines Corporation, Grass Valley, Nevada County, is now running at the rate of 800 tons per day. Installation of a large fine-crusher has been completed at the Brunswick crushing plant, and mine production is now being reduced in three stages. The bulk of the mill feed is obtained from the Brunswick mine, the neighboring Idaho mine of the company furnishing about 100 tons of ore a day. Neil O'Donnell is executive vice president and manager of the corporation, and Rollin Farmin, assistant general manager.

★ A. D. McCoy and C. F. Garner are planning to start dragline dredge operation within a month or two on the Trinity River near Douglas City, Trinity County, above the Vitzthum ranch. Available gold-bearing gravel will be mined with a 1¾-yd. shovel.

★ Verdi Development Co., of Nevada, Glenn C. Brockman, president, has installed hoist and air compressor equipment at the Albermarle mine, near Nipton, San Bernardino County, and expects to start shipping lead-silver ore soon. The property was recently acquired from Harry Trehearne, of Nipton.

★ A two-day meeting of the Southern California Section, American Institute of Mining and Metallurgical Engineers, Oct. 24 and 25, at Los Angeles, drew about 300 engineers from the mining centers and oil fields of the Southwest. The technical sessions of the Industrial Minerals Division featured papers on pegmatite minerals and mining, Owens Lake sodium minerals, barite, raw materials of the glass industry, fluorspar, bentonite, and the use of silica and cannister in firebrick. A symposium was held on light aggregates and heavy-media separation. The meeting closed with a banquet at which Harvey S. Mudd described a recent trip to Europe and the Island of Cyprus, and Louis S. Cates, president of the Institute and of Phelps Dodge Corporation, discussed the development of domestic copper production during the war and postwar period.

★ American Silver Corporation, N. James Elliott, president and general manager, has announced plans for developing properties recently acquired in the vicinity of Panamint City, on the edge of Death Valley, center of silver mining operations prior to 1900. Three tunnels, 900, 500, and 400 ft. in length respectively, will be driven to crosscut known orebodies on the company's 60 claims. Construction of a 300-ton mill is projected for 1947. Road and camp construction are now under way.

OREGON

Alcoa drills extensive area of aluminum-iron deposits

★ Kaiser Co., Inc., plans to establish an aluminum fabricating plant on Swan Island if satisfactory lease arrangements can be made with W. A. A. It would employ from 3,000 to 5,000 men. C. T. Mudge, regional director of W. A. A., said he thought negotiations could be decided by Dec. 1.

★ Dant & Russell, Inc., has driven a 400-ft. adit and opened several stopes in a deposit of the volcanic mineral known as perlite, which has been found on Mutton Mountain, in southern Wasco County. Processing with heat changes the mineral to a fluffy white material used for insulating. An experimental plant at St. Helens is using the material in the manufacture of insulating board.

★ Alcoa Mining Co. has carried on exploratory drilling in Washington and Columbia counties, in northwest Oregon, for more than a year in the large deposits of aluminum-iron laterites, finding about 30 percent alumina and 20 percent iron, according to reports. The deposits are from 6 to 20 ft. thick, with a cover of 1 to 40 ft. of overburden. Drilling begins about 20 miles northwest of Portland and spreads over a 20-mi. area from southeast to northwest. The deposits extend from Hillsboro to Rainier. Some deposits have been located south and west of Salem.

WASHINGTON

Pend Oreille Co. bids for Olin aluminum plant — Sunshine examines Arlington mine

★ Pend Oreille Mines & Metals Co., producing zinc and lead in the Metaline district, submitted a bid of $2,-000,000 to War Assets Administration for the $7,500,000 Olin aluminum plant at Tacoma. Bids were also made by Reynolds Metals Co., Eastern Metals Products Co., and Kaiser Permanente Metals Corporation, and an unconfirmed report gives the last-named company's bid as $2,500,000. The successful bidder and the amounts bid will be made public from Washington, D. C.

According to Lewis P. Larsen, of Spokane, president of the Pend Oreille company, plans are to convert the Olin plant into an electrolytic zinc plant at an estimated cost of $3,000,-000 with a monthly capacity of 30,000 tons of zinc metal. Mr. Larsen also revealed plans for acquiring from WAA the Gabbs, Nevada, concentrator to enlarge his company's plant at Metaline Falls from 750 tons a day to 2,000 tons. The completion of these two purchases would give employment to about 300 at Tacoma and 400 at Metaline Falls.

Concentrates from the Pend Oreille now go to mid-West smelters, from which the metal is shipped to Eastern ports. Under the new arrangement concentrates would be shipped to Tacoma, and the metal would go from the Pacific to Atlantic Coast by water at greatly reduced freight rates. This program also calls for daily production of 1,000 tons at the Reeves-Mac-

Washington *(Continued)*

Donald property in British Columbia, 11 miles north of the Pend Oreille, in which the company owns a 60 percent interest. It is reported by the management that tonnage increases at the two properties are planned regardless of whether or not the Gabbs plant is acquired.

★ International Brotherhood of Electrical Workers, AFL, obtained a temporary restraining order against the United Steel Workers, CIO, and the Millwood Aluminum Co. over a jurisdictional dispute at the plant, which is operated by Kaiser Permanente Aluminum Co. The AFL union charges violation of the unfair practices act, demands reinstatement of three discharged workers, and asks that an election be held to name one of the unions as bargaining agent.

★ Rowland King, exploration engineer, representing the Sunshine Mining Co., is examining the old Arlington silver-lead mine and mineral claims in the Ruby Hill district, about 20 miles from Okanogan, owned originally by the late Senator Jonathan Bourne, of Oregon. R. D. Leisk, manager of the Sunshine company; B. N. Sharp, Spokane mining engineer, who now holds options on the properties; and J. A. Lorraine, manager of the Western headquarters of the U. S. Bureau of Mines, of Albany, Ore., joined Mr. King in examinations of the properties in October.

★ Russell Parker, president and general manager of the First Thought Mining Co., near Orient, claims that the high-grade ore sought has apparently been located in virgin ground across the fault and 50 ft. below, with assays running as high as $140 in gold. Harry Townsend, of Seattle, is consulting engineer, and Charles Isenor is mine superintendent.

★ E. M. Jamieson, president of Columbia Tungsten Corporation, reports that his company has discovered a large scheelite deposit in the Summit district, in Stevens County, where the company has 15 claims. Examination of a tunnel on the 1,300-ft. level by Mr. Jamieson and Arthur L. Hooper, secretary, showed "exceedingly strong mineralization of scheelite under rays of the black light. Large crystals of scheelite showed in both walls, on the roof, and in the face. On the 1,200-ft. level scheelite crystals showed at irregular intervals for a length of 200 ft." Company officials estimate a body of ore 10 to 20 ft. wide, 150 ft. deep, and 200 ft. long.

★ Louis S. Cates, of New York, president of the Phelps Dodge Corporation and of the American Institute of Mining and Metallurgical Engineers, and A. B. Parsons, secretary of the Institute, were in Spokane in October, when Mr. Cates addressed the annual banquet of the Columbia Section. Mr. Cates expressed regret that the Government was paying 17c. a pound for

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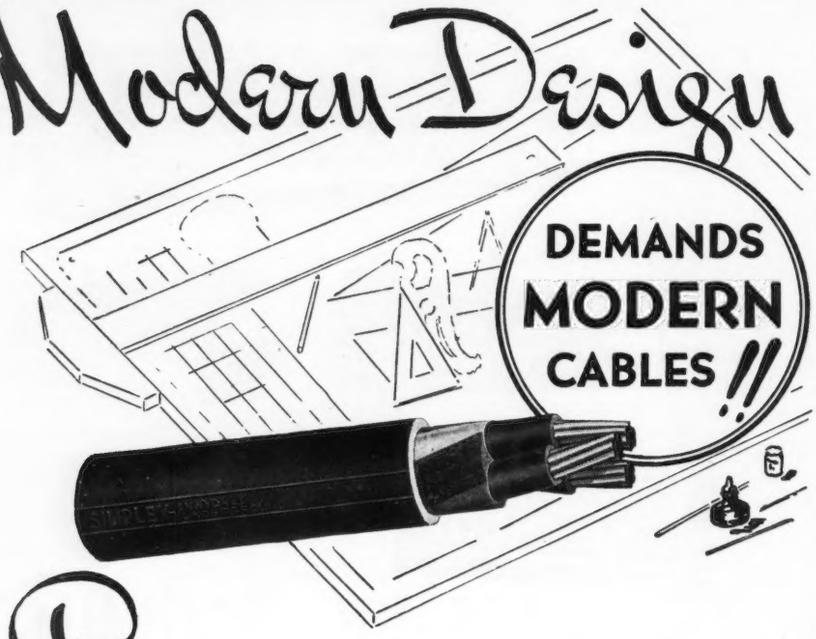

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Washington *(Continued)*

foreign copper while domestic copper was frozen at 14⅜c. He said that since strikes had been settled he believed that mines generally were operating more efficiently.

★ Wray Farmin, president of Northwest Mining Association, said in Spokane in October that the increase of 1c. a pound for primary slab zinc announced by OPA would benefit only those mines not receiving payments under the Premium Price Plan. "All the increase actually means is that the consumer will pay the extra cent instead of the taxpayer. The increase reduces the subsidy payments," he said. Manpower shortage will prevent increased production and, according to C. O. Dunlop, of Spokane, president of Silver Dollar Mining Co., a much higher price will be needed to spur operators to raise output.

★ The Government-owned ferrosilicon plant at Rock Island, 10 mi. southwest of Wenatchee, has been declared surplus for disposal by WAA, and will be offered for sale or lease at an early date, according to James G. Wilcox, regional director, at Spokane.

★ Trustees selected by a nominating committee of Northwest Mining Association for terms of three years are Philip J. Shenon, consulting geologist, of Spokane; Everett P. Hougland, of Kellogg, Idaho; J. E. Berg, Federal Mining & Smelting Co., of Wallace, Idaho; and W. Church Holmes, Sunshine Mining Co., of Kellogg, Idaho.

★ Spokane's $16,200,000 magnesium plant, at Mead, with a capacity of 48,000,000 lb. of magnesium per year and an equal amount of ferrosilicon, has been advertised for sale since last April, according to a WAA spokesman, and bids will be read publicly on Dec. 2. The award will be made at Washington, D. C. A 330-acre dolomite quarry will be sold with the plant. This was operated by Electro-Metallurgical Co. during the war.

★ H. J. Adams, vice president of the Super Sulphur Gypsum Co., Thermopolis, Wyo., told the construction and industry committee of the Spokane Chamber of Commerce on Oct. 21 that shortages have increased the demand for gypsum building materials, that the market for fertilizers in the Pacific northwest is increasing steadily, and that Spokane is the natural location for a gypsum plant to process the raw material. He said a $250,000 plant staffed with 40 to 50 persons would be reasonable, considering freight rates and cheap electrical power.

★ A net profit of $1.30 per share in comparison to $1.49 a year ago, for the nine months ended Sept. 30, was reported by Howe Sound Co., which operates the Holden mine, in Chelan County. Taxes were reported as $225,000, against $213,000 for the September quarter last year. A dividend of

Washington *(Continued)*

30c. per share was paid on Sept. 30. The company announced that it would close its mineral processing Nov. 9 for six months to enable ore production to catch up with mill operation. It was not stated how many of the 330 employees would be affected by the shift from milling to mining.

UTAH

Louis Cates sees good period ahead for copper—Bingham has first 1946 fatality.

★ Discrimination against low-cost copper producers was resulting from the current government policy of maintaining a purchase price of 17c. for foreign copper while holding big American producers to 14⅜c., Louis S. Cates, president, American Institute of Mining and Metallurgical Engineers, said Oct. 16 in Salt Lake City.

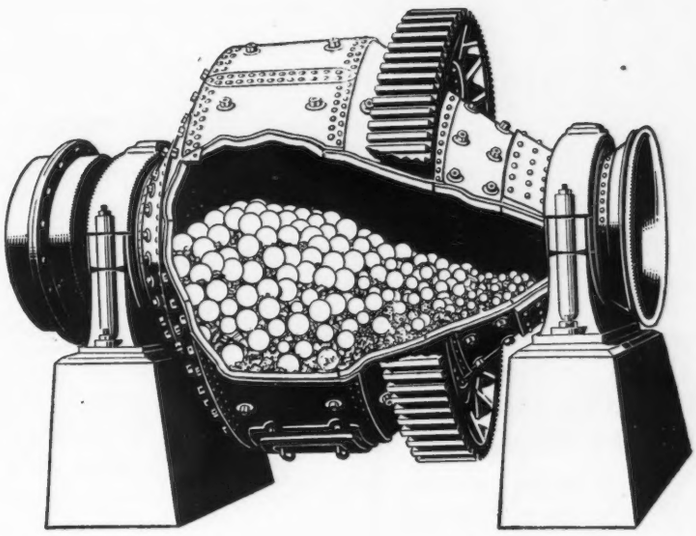
Mr. Cates, president of Phelps Dodge Corporation, and from 1923 to 1930 vice president and general manager of Utah Copper Co., predicted two or three big years ahead for the copper industry because of the existing shortage of the red metal. The electrical industry, particularly, needs more copper, he declared.

The visitor was guest of honor at the annual national president's dinner of the Utah section, A.I.M.E. The Institute, he noted, now numbers 14,000 members, a 100 percent increase in the last twelve years, and has a budget of $300,000 per year, compared with $125,000 twelve years ago.

★ Ralph D. Price, 33, Midvale, shovel crane operator for Utah Copper Co., died Oct. 29 of injuries suffered 34 hours previously when a rock fell several feet and hit him as he was moving a big shovel on Q level on the west side of the company's open-pit copper mine. None of the other workers on the power machine were injured. This was the first fatality at the mine in 1946.

★ Mining engineer graduates of Michigan College of Mining and Technology residing in the Utah area resumed alumni activities Oct. 24 at a dinner meeting in Salt Lake City addressed by Dr. James Fisher, former Dean of Mines at the Michigan college. Officers of the new alumni organization are E. H. Snyder, president, Combined Metals Reduction Co., chairman; Louis Buchman, general superintendent of operations, Utah Copper Co., vice chairman; and Carlton M. Marquardt, geophysicist, Combined Metals Reduction Co., secretary.

★ Because the livelihood of nearly half Utah's citizens is dependent directly or indirectly upon the mining industry, they should interest themselves in its future, James K. Richardson, man-



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Utah *(Continued)*

ager, Utah Mining Association, told Salt Lake Kiwanians Oct. 31.

"When the number of Utah producing mines drops in 25 years from 136 to 89, and when development of new metal fields is curtailed badly, these facts should be everybody's business," he declared.

Average value per ton of Utah ore, he said, is $3.10, compared with an average value of $14.76 in Idaho, $11.26 in Colorado, $10.95 in Montana, and $4.45 in Nevada.

IDAHO

Labor shortage holds back lead production—Five companies explore Mullan silver belt

★ Under ordinary conditions the mines of the Coeur d'Alene district produce about 90,000 tons of lead per year, but under the present labor shortage the district is producing only about half that amount, according to Bureau of Labor statistics. The Bunker Hill smelter, with a monthly capacity of 6,000 tons, is turning out only about 2,500 tons. Under favorable labor and price conditions the Coeur d'Alene district could supply practically half the present monthly requirements of United States lead production, estimated at 20,000 tons. At least four new major deposits of lead have been found in this district in the past several years, namely at the Bunker Hill, Page, Silver Syndicate, and Dayrock mines.

★ Silver Dollar Mining Co. reports earnings of $27,000 in July and $25,000 in August from ore produced from a one-third interest in the "Rotbart" area mined by Sunshine Mining Co. The other two-thirds are owned equally by Sunshine and Polaris Mining companies. Silver Dollar also announces payment of 2¢ a share on its Class "A" stock, totaling $20,000, which is in the nature of a repayment of assessments collected on this class of stock. The company levied 14 assessments of 1¢ each on the stock, and up to date has repaid 12¢.

★ Five mining developments are now in progress on the silver belt between the Osburn and White Ledge faults, at Mullan, pioneered by the Lucky Friday Silver-Lead Mining Co. The Lucky Friday company has paid its own development expenses out of ore shipments down to the 1,400-ft. level, where an oreshoot 4 to 7 ft. wide has been opened for a distance of 250 ft. The ore is a high-grade silver-lead product which concentrates to better than 300 oz. in silver and 50 percent lead per ton. Shipments have netted the company more than $200,000. On the strength of this development four other mining companies, the Hunter Creek, Lucky Friday Extension, Vindicator, and Idaho Silver, have started deep development work. Both Hunter Creek and Lucky Friday Extension have contracts with the Lucky Friday for development through the Lucky Friday shaft from the 1,400-ft. level.

★ Idaho has one of the largest deposits of commercial phosphate rock in the United States. This deposit, according to authorities, consists of two layers, the richest of which is on the bottom. To mine the rich layer it was necessary first to remove the upper layer of low-grade rock, an operation which provided no monetary return. At the last session of the Idaho Legislature funds were provided for research in the treatment of this low-grade rock, and the University of Idaho School of Mines now announces that this research program has resulted in the development of a concentration process whereby the low-grade phosphate rock can be converted into a high-grade product at a cost of around 30¢ per ton. The process has been demonstrated successfully in laboratory tests and is now ready for a large-scale trial, reports Dr. L. C. Cady, chairman of the University research council. If the commercial test proves successful, it is estimated it will increase Idaho's phosphate rock deposits by several millions of tons. The Anaconda Copper Mining Co. has been mining the high-grade deposits for several years at Conda, Idaho, and for the past two years the Simplot company has been producing commercial fertilizer.

Joseph Newton, professor of metallurgy, who carried out the experiments on the low-grade phosphate shales, found that by milling and resliming it is possible to produce a concentrate with phosphoric oxide content equal to that of the high-grade rock now being mined. His preliminary report shows a concentrate containing 31.1 percent phosphoric oxide coming from the Montpelier shales and 32.3 percent from the Fort Hall shales.

★ Following results obtained by the U. S. Bureau of Mines in diamond drilling the Pearl fault structure, at Clark Fork, Idaho, the Hope Mining Co. has sunk a 2½-compartment shaft to a depth of 700 ft., and the adjoining Whitedelf mine is preparing to sink a similar shaft.

★ The Lookout Mountain Mining Co. has recently been reorganized to resume development work on a lead carbonate deposit in the Pine Creek area, from which a large tonnage of lead carbonates was shipped from near the surface several years ago. The company has recently installed a new Ingersoll-Rand air compressor, and the Washington Water Power Co. has constructed an electric power line to the property.

★ Winding up a tour of 18,000 miles through the different mining districts of the United States, Louis S. Cates, president of the American Institute

Idaho *(continued)*

of Mining and Metallurgical Engineers, and president of the Phelps Dodge Copper Corporation, met with the Columbia Section of the Institute at Kellogg, Idaho, and Spokane, Wash. During his talk at Kellogg, Mr. Cates said that in his opinion the outlook for copper during the next few years is exceedingly good, but that the present price situation for copper was ridiculous, pointing out that the Government was paying 17¢ a pound for foreign copper, while at the same time domestic producers were held down to a ceiling price of 15⅜¢ a pound for copper produced by domestic mines with highly paid American labor.

★ Bunker Hill & Sullivan Mining Co. has declared its fourth quarterly dividend for 1946, amounting to 25¢ a share, or $327,000, bringing the company's current dividend record up to $1,308,000 for the current year and the grand total to $61,203,527.

Bunker Hill produces on an average of about 421,000 tons of ore yearly and has been operated down to the 2,800-ft. level. The mine has also been highly productive from the Kellogg adit tunnel level to the surface, a distance of approximately 1,000 ft. In 1943 the company started assembling equipment for a deeper development program and since then has installed underground hoisting and other machinery costing upwards of $800,000. It is planned to sink to the 4,000-ft. level, which will give the mine an additional 1,200 ft. of stoping ground. Bunker Hill's known ore reserves at the end of 1945 were estimated at 2,631,835 tons.

★ Douglas Mining Co., in the Pine Creek section of the Coeur d'Alenes, announces that it has made arrangements with the Small Leasing Co., which has a lease on the Douglas from the No. 6 level to the surface, to sink a winze on the Douglas orebody, starting on the No. 6 level. Depth of this development, state Douglas officials, will depend entirely on the ore developed in the sinking operation. The company's plans include drifting extensively at some deeper level on the Douglas vein and crosscutting to and drifting on the Marmion vein, a parallel structure known to contain similar orebodies to the Douglas, but which has never been worked. The Small Leasing Co. has equipped the mine with a small but modern flotation plant and has been shipping to the Sullivan zinc plant about 200 tons of zinc concentrates monthly. Lead shipments aggregate about 17 tons monthly. The average zinc content of the ore is 6.55 percent and the average lead content 2.5 percent, with 0.85 oz. silver per ton. This operation has netted the Douglas company $65,119 in royalties.

★ Oscar Nordquist, manager of the Ione Mining Co., in the Murray district, says the company's recently com-

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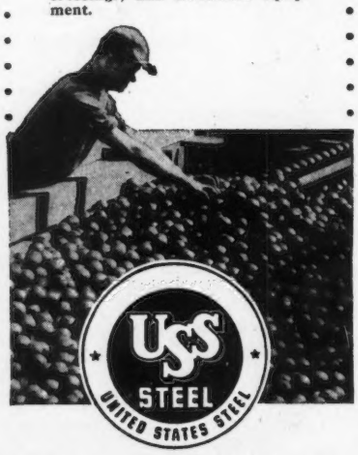

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UNITED STATES STEEL

Idaho *(Continued)*

pleted diamond-drill campaign has located a wide shear zone of lead ore at a depth of 1,165 ft. The company is now extending a tunnel operation to open the deposit.

★ Three local mining companies, controlled by the Henry L. Day family and associates, have declared their first dividend for 1946. The Tamarack & Custer company dividend was for $50,000 on a basis of 1¢ per share, and brought the total dividend record for the company to $2,792,123. The Sherman Lead dividend was for $36,750, also at the rate of 1¢ a share, and brings the total dividend record for this company to $723,975. The Dayrock dividend was for $34,944, or at the rate of 2¢ a share, making the company's total dividend record $376,441. The current disbursement was the first dividend paid by Dayrock since June 7, 1943.

The Dayrock mine was the scene recently of the discovery of a major-sized body of lead-silver ore on the 650-ft. level, where an oreshoot from 6 to 15 ft. in width has been proven for a length of 200 ft. Hand samples show values of 48 oz. silver and 76.5 percent lead per ton. The company is now crosscutting for the same ore on the 800-ft. level.

★ Polaris Mining Co., employing the clamshell-type mechanical mucking machine which was invented by J. Murray Riddell, claims another new record in shaft advancement by sinking the Silver Summit shaft 204.9 ft. in 30 days in September. The previous record for the crew was 184 ft. in 31 days in July. The three-compartment shaft is down nearly to its objective point at the 3,000-ft. level.

★ The Bradley Mining Co. is operating the only open-pit mining enterprise in Idaho at Stibnite, where 300 men are employed in mining and milling gold, antimony, and tungsten ores. During the war the Bradley company furnished 50 percent of the tungsten used in the prosecution of the war, from an open-pit deposit discovered by U. S. Mines Bureau in diamond drilling for antimony. The tungsten deposit is now practically exhausted. A million-dollar electric power line was constructed to the mine during the tungsten operation. To comply with State laws regarding stream pollution, the company has been compelled to build new settling vats for over a mile in length and 1,400 ft. wide at the widest point. The storage capacity is estimated at 12 million tons of mill tailings. In addition to the tank, it has been necessary to dig a canal a mile in length to divert the waters of Meadow Creek around the settling basin.

★ The Crown Point Mining & Milling Co., a Washington corporation with headquarters in Seattle, has purchased the Four Square gold mine and mill, on Prichard Creek, near Murray, about 20 miles north of Wallace, from

the Trinity Trust Co. The property includes 28 mining claims, together with a modern milling plant of 100 tons' daily capacity designed by A. W. Fahrenwald, dean of the Idaho School of Mines. The original company expended around $300,000 in construction and mine development work, and crosscut one gold quartz vein in the tunnel work. A 7,000-ton test run of this ore netted $5 per ton in gold, and developed the fact that the ore contained an appreciable amount of tungsten, for which no provision had been made in the mill. The company sunk a shaft on the vein to a depth of 470 ft. and completed a raise from the tunnel level to the surface. The ore in the shaft was reported to carry about the same gold values as above the tunnel level, with some increase in the tungsten content. The ore blocked out by the raise work was estimated at about 50,000 tons.

The Crown Point company plans to convert the milling plant into a custom mill for the treatment of silver-lead ores from mines in the Murray district before developing its gold properties.

★ The Lynch of Pine Creek Mining Co., in the Pine Creek district, has officially changed its name to the Amy Silver Lead Mining Co. The company has suspended milling operations because of inability to secure necessary repair parts for a sink-and-float unit, and will devote the winter months to crosscut exploration work underground in the Amy tunnel. At the annual meeting of the stockholders of the company, held on Oct. 28, the following officers and directors were elected: President, Cecil Anderson, Kennewick, Wash.; vice president, T. L. Thompson, Connell, Wash.; secretary-treasurer, Mrs. Christine Brown, Kellogg, Idaho.

MONTANA

Long adit will explore Easton-Pacific mine at depth

★ Reopening of the Easton-Pacific mine, near Virginia City, closed since 1915, has been announced by the U. S. Grant Mining Co., Walter H. Myers, president. It is planned to start driving a 3,600-ft. tunnel to cut the several known veins at a depth of 625 ft. as soon as buildings now under construction are completed. Thirty-five men are currently employed. William G. Schmidt is vice president and C. L. Peterson is secretary-treasurer of the company, which also operates the Alameda-Bamboo Chief mine.

★ Silver Lode Gold Mining Co., a Washington corporation, has taken over twelve mining claims near Virginia City, according to Ted Johnson, of Manson, president. P. Evan Oscarson and John Hatch, of Spokane, are other officers.

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COLORADO

Front Range Mines will develop holdings—American Lead, Zinc & Smelting enters Ouray area.

★ Front Range Mines, Inc., has been organized as a Colorado corporation and is operating the Strong and Mary Cashen mines, in the Cripple Creek district; the Mattie mine, in the Clear Creek district near Idaho Springs; and the Melvina mine, in the Gold Hill district of Boulder County. John Deerksen, operator of the Strong mine, is president; George Teal, of Boulder, is vice president and general manager; and Dan Kamphausen, of Denver, is secretary-treasurer. The new company is said to be financed by Denver and Chicago capital. Development work is going on at all mines, in addition to construction of new surface and underground facilities. At the Mattie property the Newton shaft is to be deepened, and a new mill is planned for 1947. At the Melvina mine a new surface plant is to be installed.

★ The Silver Bell mine, in San Miguel County, is being renovated and modernized under general direction of Charles Dahlberg, of Ophir. The tunnel has been cleaned out and completely retimbered, and an electrically driven air compressor is being substituted for the old gasoline-driven unit. The mill is being remodeled as a 50-ton modern flotation plant. The ore is complex, containing copper, gold, silver, lead, and zinc.

★ Champion Mines Co. is planning operations on the W. P. H. property at Cripple Creek. Jesse Simmons, of Denver, is president. A gas hoist has been installed and the manway repaired. Mining operations will be in charge of Francis Gunn. The company is sinking a winze on the 50-ft. level of the Flying Cloud mine, where indications of ore are being followed up. The Flying Cloud, on the Cameron Mines property bought last spring by Golden Cycle, has been leased to Champion Mines Co.

★ American Lead, Zinc & Smelting Co., Howard I. Young, president, has bought the J. R. Sonza lease on the famous old Bachelor and Syracuse properties in Ouray County, and will develop them intensively. This is said to be the company's initial entry into Colorado.

★ Shenandoah-Dives Mining Co., at Silverton, and Local 22930, AFL, have signed a new contract retroactive to Aug. 1, 1946. It provides for the union shop; for shift differentials of 4c. and 8c. an hour for second and third shift; and for a 40-hour week. Standard work-week is 48 hours with time and one-half for the last 8 hours; if the work-week is cut to 40 hours, base rates are to be raised 4.5c. an hour. Base pay starts at 98c. an hour for hand muckers and nippers, ranging up to $1.19 for mechanics, in the mine; at the mill, base pay starts at 89c. for laborers and goes up to $1.09 for machinists. Paid vacations are provided for employees who have been with the company a year or more. Six holidays are named on which, if the mine is operated, pay is to be time and one-half.

★ A motion to dismiss one count of the anti-trust indictment against U.S. Vanadium Corporation and Vanadium Company of America was argued recently in the U.S. District Court in Denver, and motions were presented for bills of particulars on both counts. The count on which dismissal is asked is the second one of the indictment, alleging that the companies and some of their officials conspired to set the price of vanadium in its varied forms. It is contended that this count does not state an offense against U.S. law; that it is not stated with sufficient clarity to enable a proper defense to be made; and that it is so vague and indefinite that even if acquittal should be won a new indictment could be brought on the same grounds, thus putting the defendants in double jeopardy. The first count is the charge of conspiring to monopolize production and sale of vanadium.

A motion to permit inspection of grand jury records had previously been denied by U.S. District Judge J. Foster Symes, who has ruled, however, that companies' counsel may receive photostatic copies within 30 days of the date set for trial.

ARIZONA

Senator McFarland protests RFC purchases of foreign copper—Iron King wins sales tax suit

★ The Morenci mine of Phelps Dodge Corporation is becoming one of the nation's outstanding open-pit copper producers. Initiated in 1942, the project has already yielded 114 million dollars' worth of red metal from Napoleon Peak, which is slowly being mined away. The orebody embraces an area of three-quarters of a square mile. Phelps Dodge expended 70 million dollars in creating the Morenci project. It is estimated that 18 years' ore reserves are in sight. The working force at present numbers 2,500 men.

★ Senator Ernest W. McFarland, of Arizona, recently protested the purchase of 110,000 lb. of foreign copper at prices higher than those established by OPA. McFarland says he cannot understand why the Civil Production Administration, which sanctioned the foreign copper purchase for the Reconstruction Finance Corporation, allows outside copper to be purchased at rates higher than domestic prices.

"It so happens that there are some producers in this country, and in Arizona, who do not get the premium

prices and hence are at a disadvantage in competing with foreign copper," McFarland asserted. "Obviously, the price paid the producers here affects wages and all other factors, and I do not and will not approve a policy which forces our labor to compete with cheap foreign labor."

★ The Arizona State Supreme Court has affirmed judgment of the Yavapai County Superior Court in favor of the Iron King Trust, which sued to recover sales taxes levied on ore shipped to a smelter. The judgment involved $2,187.43.

T. J. Byrne, trustee for the Iron King property, contended the freight and treatment charges should be deducted from the gross proceeds of sales of lead and zinc recovered from concentrates. The State Tax Commission argued that the charges should be allocated on a basis of proportionate values of the taxable and non-taxable metals sold. The ore contained non-taxable silver and gold. Judge Arthur T. La Prade, who wrote the opinion, ruled that "the amount of the tax is the figure which will result by using the rate of 1 percent against the value of the product."

★ Louis S. Cates, president of the Phelps Dodge Corporation, recently announced that the next two or three years hold a bright outlook for the continued production of copper in Arizona, but would not forecast conditions beyond that time. Cates verbally blasted the government's policy of purchasing foreign copper at prices higher than those established in this nation by OPA.

★ David Reynolds, vice president of the Reynolds Metals Co., which is operating the $35,000,000 Phoenix aluminum plant, said it would reach peak operation about April, with from 1,500 to 2,000 employees.

★ Magma Copper Co. is continuing work on the San Manuel orebody, termed the largest strike of its kind in Arizona since the turn of the century. Sixty exploratory drill holes completed up to July 15 at an average cost of $20,000 a hole showed an average copper content of only 0.79 percent for the 100,000,000-ton orebody. Samples were taken every 5 ft. from the surface to the lowest depth of 2,600 ft. The success of the undertaking rests upon the ability of the company to figure out an economical and profitable mining method.

★ The annual meeting of the Arizona Section, American Institute of Mining and Metallurgical Engineers, held at Tucson Oct. 28, 29, and 30, featured a motor trip to the Morenci open pit and three technical sessions at which a wide range of technologies was covered by papers on mining and metallurgy, geology, geophysics, and milling practices. Louis S. Cates, president of the Institute and of Phelps Dodge Corporation, was the principal speaker at the banquet.

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Arizona *(continued)*

lowing papers on mining and metallurgy: "Smelting Practice at Hayden Plant, American Smelting & Refining Co.," by Hubert O. Woods; "Mineral Resources of Germany," by Joseph H. Hedges; "Panel Track Methods at the Morenci Open Pit," by Walter C. Lawson; "Ore Occurrence at the Iron King Mine," by H. F. Mills; "Carbon-Cyanide Mill Tests at the Getchell Mine," by R. A. Hardy; "Bagdad Changes From Underground to Open-Pit Mining," by Ernest R. Dickie; and "Mining of the Castle Dome Copper Deposit," by Jackson Hoagland.

In the field of geology and geophysics papers presented were as follows: "Structural Control of Copper Mineralization at Bagdad," by Charles A. Anderson; "Geology of the Castle Dome Deposit," by Nels P. Peterson; "San Manual Prospect," by Hubert J. Steele and Grant R. Rubly; "Geophysical-Geological Approach to Western Mining Problems," by Sherwin F. Kelly; and "Bottoming of the United Verde Sulphide Pipe," by Paul B. Yates.

Papers on milling practices included the following: "Custom Milling at the Sahuarita Mill of Eagle-Picher Mining & Smelting Co.," by E. H. Crabtree, Jr., and Neil S. Parker; "Milling Practice, Morenci Reduction Works Concentrator," by Benjamin H. Cody; "Milling Practice at the New Lead-Zinc Concentrator of Phelps Dodge Corporation, Bisbee," by R. C. Thompson; and "Milling Practice at the Iron King Mine," by Howard R. Hendricks.

TRI-STATE

Smelters depart from customary basis—Riverside mines and Burton mill to be operated

★ Lifting of the OPA ceiling on slab zinc, Oct. 14, which permitted the raising of the East St. Louis metal quotation from 8.25¢ to 9.25¢ a pound, benefited smelters rather than Tri-State mine operators. District ore producers held their concentrates from the market for two weeks when smelters refused to share any part of the $20 per ton metal increase.

★ F. W. (Mike) Evans has taken a lease on the old Renzenhauser land and old Burton mill, now owned by Wilbur Owen, near Fillmore's bridge south of Shoal Creek, and is preparing to reopen the old Riverside mines. Evans has entered into a mining and milling contract with the Craig Mining Co., which has opened a new mine on the old Fillmore property to the west of the Renzenhauser land. Floyd F. Craig and sons, Willard W. and Gordon J., sank a new shaft on the Fillmore land, a 208-acre tract now owned by Gordon Craig, and have been opening the mine on the 160-ft. level. Mining operations will be conducted by the Craig company at the new shaft and also on the old Burton mill and field shafts on the Owen land, which comprises 120 acres. Evans has completed the recribbing of the two Burton shafts, where water stood within 40 ft. of the top. An 8-inch Pomona pump has been installed at the mill shaft to unwater the old workings, which extend some 1,700 ft. from the mill shaft to the field shaft to the southeast. Although the mines were filled with water, the inflow is not expected to be large once the workings are unwatered, Evans said. Craig and sons have opened up the shaft to the extent that about 7,000 tons of ore have been stockpiled on the surface. The ore will run about 7 percent in blende recovery values, Craig said. The zinc ore is of exceptionally high grade, and is found in white dolomite of the Fern Glen bed of the Reeds Spring formation. The same ore and formation occurred in the old Burton, or Riverside, mine workings at about the same level. The inflow of water at the new shaft is small.

The old Riverside mines were taken over by F. E. Burton, I. V. Ewing, and the late Ed Miller in 1935, when the Burton mill was constructed. Later the property was operated by the Boulder Lead & Zinc Co. It has been idle for several years, and Evans will have to make extensive repairs to get the milling equipment in operating condition.

ARKANSAS

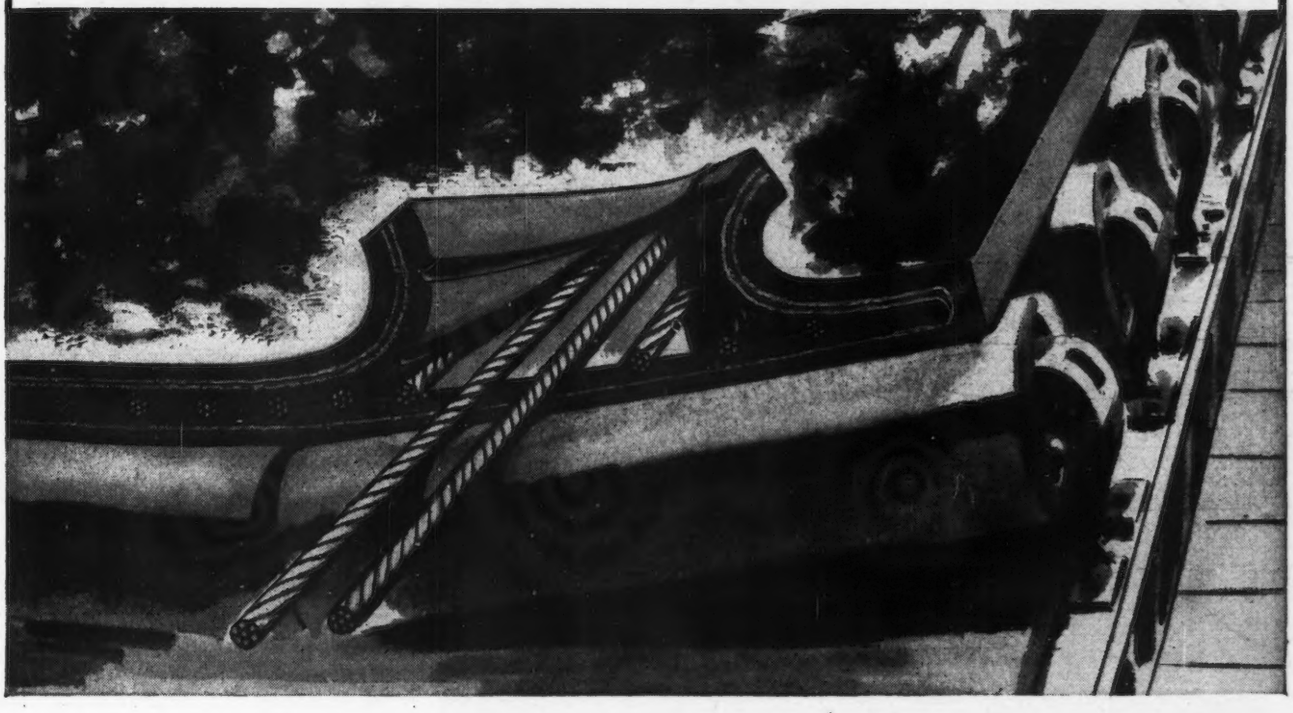
Underground mining preparations proceeding at Magnet Cove

★ The Tex-Ark Rock Wool Corporation has announced plans for construction of a large rock-wool plant at Texarkana. The company plans to mine the raw material from the Ozan marl formation, a sandy, micaceous marl reported to be exceptionally well suited to the manufacture of rock wool. The State Geological Survey conducted initial tests on the material and the Rolla, Mo., division of the U. S. Bureau of Mines did additional testing.

★ The Magnet Cove Barium Corporation, of Malvern, is proceeding with plans to start underground mining operations on its large proved body of barite ore in Hot Springs County. Much of the surface mine plant is completed, and preparatory work on the inclined shaft is under way. Alfred D. Rood is the engineer in charge. All of the company's large production to date has been obtained by open-pit mining of the deposit.

★ The Dulin Bauxite Co. has completed mining and stockpiling one section of a high-grade bauxite deposit in Pulaski County for Consolidated Chemicals, Inc. The latter company is making progress with construction of a modern plant for the purpose of

Steelply REINFORCED CONVEYOR BELTING



. . . *multiplies* haul and lift!

IT'S TIME TO FORGET your previous standards of conveyor belt performance. Now—with Roebling "Steelply" reinforcing — belts of multiplied strength can be built . . . for six times the haul, six times the lift! On long, uphill haulage of coal, ores, aggregates and other heavy bulk materials, higher tonnages can be delivered continuously, uniformly, economically.

Instead of several belts now needed on long, multi-unit installations, *one* "Steelply"—reinforced belt does the job, eliminating transfer points and thereby reducing equipment costs. Its higher strength permits heavier loading of the belt. This means the same output can be obtained at reduced belt speed . . . so power costs are down, idler wear and maintenance lessened.

Next time you order from your belt manufacturer, ask him to tell you more about conveyor belting reinforced with Roebling "Steelply".

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WHAT IS STEELPLY?

Roebling "Steelply" is the load-carrying core in this revolutionary new kind of conveyor belting. It consists of small-diameter steel cables . . . finely stranded, extremely flexible, practically stretchless . . . encased in sturdy, rubber-impregnated duck. "Steelply" is also used to strengthen elevator belts, V-belts, flat transmission belts, heavy-duty hose and truck tires.

ROEBLING

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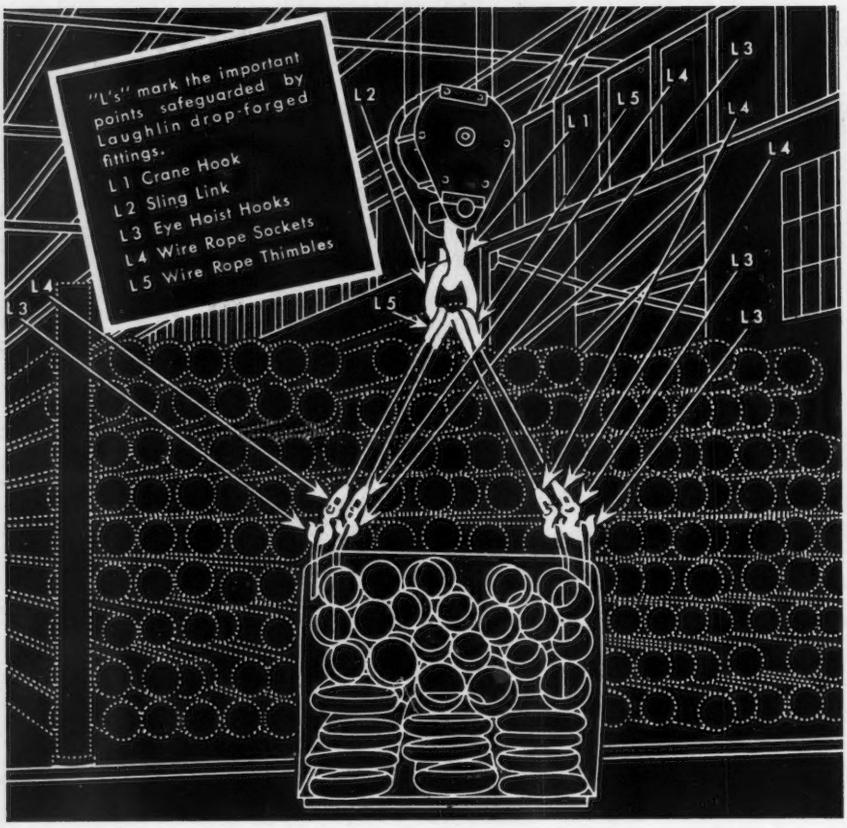
FITTING PROTECTION

With Laughlin Quality



Laughlin fittings bring these three important advantages to every type of hoisting, materials-handling and lashing job.

1. *Greater Safety.* The Laughlin line has many exclusive safety features, as in Safety Clips and Safety Hooks . . . every fitting is designed to bear its full share of the load, without crushing or weakening your wire rope or chain.
2. *Greater Strength. Drop-forging* makes Laughlin fittings tougher, stronger, longer-lasting.
3. *Greater Economy.* No waiting for special designs or made-to-order dies. The fittings you need are *standard* in Laughlin's complete line. And their longer life means less operating expense.

Learn more about these Laughlin quality fittings that protect workers, loads and equipment, while costing you less to use. Send for complete catalog. Address Dept. 5, THE THOMAS LAUGHLIN COMPANY, Portland 6, Maine. Laughlin fittings are distributed through mill, mine and oil field supply houses.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS

Arkansas *(continued)*

producing chemicals and removing iron from bauxite. F. M. Stelling is superintendent.

MISSOURI

St. Louis S. & R. Co. to reopen Missouri Cobalt mine

★ The St. Louis Smelting & Refining Co., of Fredericktown, is planning to reopen the old Missouri Cobalt mine, at Fredericktown. The workings have not been entered in recent years, although the company has been doing development work and mining from new shafts near by.

★ The And-Mor Mining Co., of Fredericktown, is building a small gravity mill to treat tungsten-lead ore from the Apex No. 2 mine, in Madison County. The property is adjacent to the old Einstein silver mine.

★ The American Metals Co. is continuing its exploration work for lead near Palmer, in Washington County. Three churn drills and two diamond drills are operating.

★ On Oct. 22 all employees of the St. Joe Lead Co. in southeast Missouri were called out on strike by the local CIO union in a dispute arising when an employee was discharged for refusing to obey orders given by his foreman. The union demanded that the employee be reinstated and the foreman discharged. Both the company and the union (Local 648) agreed to abide by the decision of a U. S. Department of Labor arbitrator. After reviewing the facts in the dispute, the arbitrator, Aaron Horvitz, of Buffalo, N. Y., declared that the employee "was guilty of refusing to obey a reasonable operating order involved in his work," but because of his past work record should be reinstated on Nov. 11 at his old work status, but without retroactive pay during the period from Oct. 22 to Nov. 11. A telegram announcing the decision was received by the company on Oct. 31 and work was resumed in all departments at 7 a. m. on Nov. 1.

GEORGIA

New Riverside increases capacity for washing barytes—Paga mine plant to reopen

★New Riverside Ochre Co., Cartersville, Ga., has installed a revolving grizzly in its barytes-washing plant, replacing the vibrating grizzly, which has increased capacity 25 percent. Production is running at 1,700 tons per month.

The company has started a beneficiation plant in the barytes area near Tiff, Mo., and is producing about 800

tons of glass ore per month. The output is used in making bottles and containers. Reese Woolford, former assistant superintendent at New Riverside's Cartersville plant, is in charge. Tom Duckett, formerly superintendent at the Cartersville properties, is now in charge of the company's properties in the Sweetwater district in Tennessee, about 10 miles northwest of Athens. Production is about 40 tons per day of crude barytes. John Cobb, who has been with New Riverside for about nine years, is now superintendent at Cartersville.

★ Thompson, Weinman & Co., Cartersville, Ga., has acquired marble properties west of Sylacauga, Ala., to supply requirements for the Cartesville plant. The J. E. Nivens property is being equipped with derricks and other machinery. Contracts have been let for 50,000 cu.yd. of stripping. It is expected that production will be at the rate of 4,000 tons per month. J. G. Miller will operate the Alabama properties.

The company plans to reopen the flotation plant at its Paga barytes mine at Cartersville. Various improvements have been made.

NEW YORK

Port Henry mines win Republic Steel safety award

★ The Port Henry district of Republic Steel Corporation has been awarded a safety plaque in recognition of having the lowest accident severity rate of any of the corporation's ore mines in 1945. The severity rate for the district, which includes the Harmony and Old Bed mines, at Mineville, was 0.97, one of the lowest ever recorded by a metal mine. The award was formally presented by R. H. Ferguson, manager of safety for Republic Steel Corporation, at a meeting in Port Henry attended by the foremen and supervisory staff of the mines. Robert J. Linney, district manager, accepted the plaque in behalf of the district organization. The Port Henry district previously won the same award in 1943.

ALASKA

Nabesna resumes concentrate shipment—Goodnews Bay Co. options Birch Creek ground

★ Nabesna gold mine made its first shipment in six years on Sept. 15, according to Carl Whitham, general manager. The shipment consisted of more than four tons valued at $1,000 a ton. The concentrates were sent 235 miles by truck to Valdez, and will go to the Tacoma smelter. A crew of 16 was employed from June

TEN MEN SAVED!

WHEN THIS DIXIE NON-CLOG HAMMERMILL WENT TO WORK

When a cement plant* can whip a bottleneck, speed production and reduce costs at one and the same time—that's news! The credit in this case goes to a DIXIE Non-Clog Hammermill with the patented, exclusive, Movable Breaker Plate.

With a DIXIE the Company found it could handle even the *wettest, stickiest* material direct from the quarry without slowing down production or clogging the feed. The necessity for extra men at the feed hopper was eliminated . . . the time of 10 men was saved.

Production miracles like this are frequent in plants using DIXIE Hammermills. Wherever DIXIES are installed costs go down, output goes up, shutdowns are minimized. Is it any wonder that more and more Hammermill users are saying: "My next Mill will be a DIXIE."

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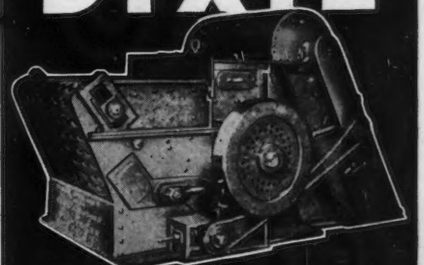

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Filter Media Corporation

SPECIALISTS IN FILTER CLOTH FOR INDUSTRIAL FILTRATION

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CHICAGO SALT LAKE CITY

Alaska *(continued)*

1 in rehabilitating the property, and the mill went into operation late in August. Weekly shipments of similar size were to go out until the road closed. Whitham said the mine would operate the year around.

★ A group of mining graduates has bought Nixon Fork, a gold property on the Kuskokwim River, near Medfra, from a partnership including Charles and Dolf Mespelt, according to reports. The group includes Harold W. Culver, who is in charge of development; Dean H. G. Wilcox of the University of Alaska; L. E. Nappe; Joe Smith; and Thomas Boyle, superintendent at the mine.

★ George Monroe, dredge man with the McRae-Patty operations, reported in October that the company's dredges on Coal Creek and Wood Chopper Creek had closed down Oct. 10 for the winter.

★ Al Anderson, executive secretary of Alaska Miners' Association, told the group in Fairbanks on Oct. 7 that the main problems for 1947 placer mining operations would be shortage of manpower, transportation difficulties, and lack of materials. He said that in addition to these shortages, this season there was a water shortage in several districts.

★ Flagstaff mine, in Karta Bay, Prince of Wales Island, under option to Santiago-Alaska Mines, Inc., will be examined by Aner W. Erickson, company engineer, of Ketchikan. If results are satisfactory, further development will be started, according to R. Crowe-Swords, president of the Santiago company. The company suspended operations from Oct. 1 to Nov. 1 on its Dolomi gold property while awaiting new equipment which includes a 50-ton cyanide plant. Among the installations completed at the property since May are an inclined tramway for moving machinery to the mill; a 400 kw. hydroelectric plant; a mess house for 30 men; a bunk house; the rebuilding of a 4,000-ft. narrow-gage trestle; and a flume. If equipment arrives as planned, 16 men will be employed by the end of the year.

★ The Riverside mine, near Hyder, employed two crews last summer and may continue work through the winter. A crew was also at work at the Salmon gold property, beyond the Big Missouri. Al Phillips was at the Tide Lake mine, in the same district.

★ The past season saw considerable activity in the Long Creek area. Placer operations were resumed after a three-year shutdown by the Long Creek Mining Co., Trail Creek Mining Co. and Greenstone Creek Mining Co. Bulldozers and pump units were used due to delay in procuring draglines. All three companies are said to be planning operations on a larger scale next season.

★ Goodnews Bay Mining Co. recently took options and leases on several miles of placer holdings on Birch Creek, seven miles from Long Creek, where gold was formerly produced by drift-mining methods. Principal owners are J. C. Slenes and associates and Gus Votila and partners. The company plans to do exploration work on the properties next season.

★ In a letter addressed to Secretary of the Interior J. A. Krug Sept. 30, Carl J. Trauerman, secretary of the Mining Association of Montana, wrote the following: "I was very much interested in the description of your Alaska trip, as outlined in the Sept. 2 number of Time magazine. On page 18 of that number, it states: 'He was less than enthusiastic about the gold industry, which dredges up gold to be sold to the Government at an artificial $35 an ounce and is then carefully reburied in Treasury vaults.' If you have anything to add to or detract from the item quoted, I would like to publish it in a future number of the (Mining Association of Montana) News Letter."

Secretary Krug replied as follows:

"The development of Alaska has followed a familiar pattern to be found in many frontier areas where gold has been one of the first of the natural resources to reach mature production. Although gold seems certain to retain a very important place in the Alaska economy, I believe that development of other of the many resources of the Territory is destined to receive increasing emphasis in the future.

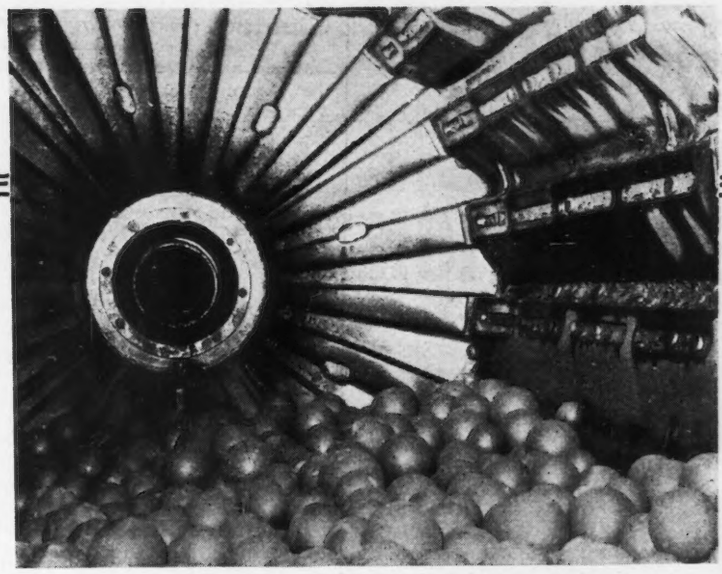
"The implication that can be read into the Time magazine quotation that I attacked the monetary use of gold in the United States is unfortunate as it does not accord with my views."

CANADA

Mine labor shortage continues — Granby strike settled — Quebec explorations encouraging

★ Labor shortage in Canadian mining continued through October. However more men are applying for work and a reduced turnover is noticeable. Ontario and northwestern Quebec camps reported an increase in working crews as a result of a movement of men from western Canada; fewer men from Nova Scotia, Quebec, and Ontario were applying for jobs. Housing is still inadequate because of the slow progress that is made in new building projects.

★ Strike action in British Columbia came to an end at Granby Consolidated as new trouble broke out at the Polaris-Taku mine, where all work was shut down following union demands for an 80 percent pay increase. The company offered a 30 percent increase in take-home pay which, although higher than at gold mines in



Actual Installation of Howes "Double-Step" Liners in Ball Mill

NEW LINER DESIGN *Proves* SATISFACTORY IN SERVICE

• Since the completion of tests in 1942, the Howes "double-step" liner has found wide acceptance. Successful installations are working in Arizona, California, Colorado, Illinois, Kansas, New Mexico, Utah, Virginia, Mexico, Ontario and Quebec.

Here are the figures from two operations:

Shenandoah-Dives Silverton-Col.	Tons	Eagle-Picher Taxco, Mex.	Tons
Howes liner	187,340	Howes type	92,143
Preceding liner	125,679	Step type	76,111
Best previous liner	164,208		
Poorest previous liner	114,495		

The HOWES liners in these two cases were "AMSCO-HOWES DOUBLE-STEP LINERS" made by the American Manganese Steel Division of the American Brake Shoe Co.

THUS we see an increased liner life of from 21% to 49% with liners of substantially the same weights of comparable materials, *when the HOWES DESIGN is used.*

HOWES LINERS can be cast from any of the regularly accepted irons and steels. Because of the design, HOWES LINERS wear longer, grind better and increase profits through higher production and lower operating costs.

HOWES LINERS are available in all mining localities through licensed foundries. Your own foundry can secure a license promptly. United States and Canadian patents have been issued to protect the HOWES designs.

Write for information concerning the principle of the HOWES DESIGN *and plans for your own individual requirements.*

Use HOWES BALL MILL *Liners* FOR LOWER GRINDING COSTS

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Consulting Metallurgical Engineer

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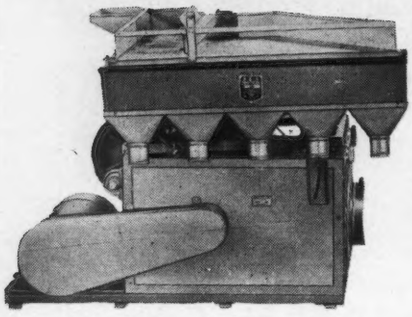
AIR TABLE SEPARATION



Do You Know

that present users of the Sutton, Steele and Steele Air Table are among the leaders of American Industry?

that these industrial companies have adopted this Air Table for specialized problems in separations?

that these Air Tables are used on jobs as large as 1,200 tons a day?

that capacities up to 8 tons per table per hour are available?

that these Air Tables will handle up to ¾" particles and will separate materials with 10 percent difference in weight?

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Canada *(continued)*

Ontario and Quebec, was rejected by the union.

★ The Dominion Bureau of Statistics reported that mine employment declined moderately in the last week of August in contrast to a generally upward trend for other industries in Canada. Per-capita weekly earnings for 73,477 employed in mining advanced from $38.84 to $39.10 in August, compared with $38.25 a year ago. The average hours worked were 42.9 per man per week, compared with 43 hours in August, 1945.

QUEBEC

★ Large-scale prospecting activity this year in New Quebec, including the large areas adjoining Labrador and north of Lake Chibougamau, was continued into October because of the unusually mild weather. Limited reports indicate that important new lead and magnetite orebodies may be exposed by discoveries made by Mistassini Explorations, Ltd. A. H. Tate has had field parties working this year which were made up of eight engineers and prospectors and three Indians. Working from June 15 to Oct. 10, these parties were serviced by the commercial airline based at Roberval, Lake St. John, using maps prepared from air photography. Cost of the field work, amounting to $28,000, was defrayed by a group of mining companies associated in the venture with Quebec Gold Mining Corporation. It is planned to develop the discovery areas by means of subsidiary companies. Dr. Frank C. Buckland and J. G. McCrea are in charge of the project.

★ The Quebec Department of Mines has issued its report on mineral production in the first nine months of the year. This shows gold produced by 22 mines amounting to 4.5 percent less than in the same period of 1945. Clay products were 41.0 percent higher, cement was 31.0 percent higher, and asbestos 11.0 percent above last year's record. All metals were considerably lower than 1945 figures. Copper at 58,374,530 lb. was 30.5 percent down and zinc was 16.5 percent less at 71,613,019 lb. The major gold producer, Noranda, recovered $4,877,127, followed by Sigma with a total of $1,411,140.

★ Consolidated Beattie Mines should be operating on a profitable basis within the next six months, according to a report submitted to the annual meeting by W. B. Maxwell, president. In the 3½ years since the tragic glory hole cave-in, development work has advanced steadily in the Donchester section of the property, and the cleaning out of the main shaft has seen good progress. The Donchester orebody now has a length of 800 ft., of which 500 ft. has been developed as continuous ore over widths from 6.5 to 25.5 ft. The ore occurs in a shear zone within the large porphyry body about 3 miles in length. Farther east along the strike, the Central Duparquet shaft is being deepened to 1,500 ft, for exploratory work.

★ Quemont Mining Corporation, con-

A TYPICAL TRACTOR TRAIN IS SEEN passing through the small settlement of Hay River, on Great Slave Lake, Northwest Territories. Tractor freighting provides an important link in the winter transportation of food and heavy equipment to mining properties in the sub-Arctic regions. The trains usually consist of a diesel-powered tractor pulling three or four ruggedly built sleds and a caboose in which living quarters are provided for a crew of four to six men. Tractors are frequently fitted with snowploughs to clear the trail, and in extremely heavy snowfalls flanges attached to the caterpillar tracks aid in keeping the machines on top of the snow. Trips are operated on schedule to the major mining operations throughout the winter. The longest run at present is from Grimshaw, Alta., to Great Slave Lake and the Yellowknife area, a distance of about 600 miles. National Film Board Photo.

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To our employees: *"Welcome back."*

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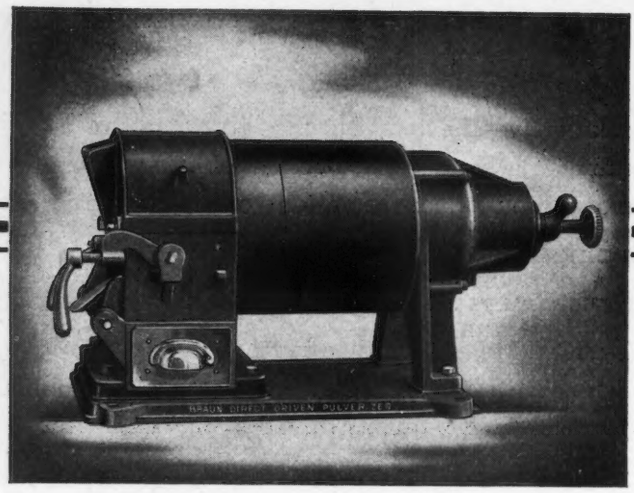
In behalf of its 67 Direct Factory Branches and 600 Dealers

THREE SIMPLE ANSWERS



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To meet every conceivable laboratory need, Braun Corporation designed two separate Pulverizers with grinding plates made of a special tough alloy, designed so that they have just the right "nip" to take hold of the sample quickly. Minimum moving parts assure low operating and maintenance costs.

The three models are described below:

TYPE UD DIRECT DRIVEN PULVERIZER—the last word in lab machinery of this type. Powerful, self-contained motor, ball bearing equipped throughout, permanently lubricated. Ideal for extremely heavy work demands.

TYPE UA FOR SHAFT AND PULLEY DRIVE—meets all requirements for fast, effective grinding where this type of installation is to be used.

TYPE UA WITH MOTOR AND V-BELT DRIVE—a compact unit ideal for laboratories where an independent power unit is desired.

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Canada *(continued)*

trolled by Mining Corporation of Canada, reports that the 6 million tons of ore indicated last April above the 700-ft. horizon may be doubled by the end of this year as the result of continued exploratory work. The report on work for the third quarter states that drilling has indicated ore at vertical depths down to 1,550 ft. Some of the new drilling has also shown higher values in both copper and gold. Three drills now working underground and one on surface are to be increased to 12 machines after the lake ice is strong enough. Since the first discovery in February 1945, more than 250 holes have been drilled and footage since the first of 1946 has amounted to 58,883 ft. Drifting on the 200- and 900-ft. levels under the lake has amounted to 8,959 ft. J. H. C. Waite is president.

★ Aumaque Gold Mines, in Bourlamaque Township adjoining the Lamaque mine on the east, reports important ore disclosures on the bottom 500-ft. level, where previous work had developed three short oreshoots. The new ore averages 5.6 ft. in width for a length of 55 ft. and shows a cut grade of $12.25 per ton. Good prospects have been shown for developing additional length. The new ore is associated with fingers of granodiorite extending off the nose of the main intrusive. Further work is to be done west on the 250-ft. level to explore the upward extension of this promising new structure.

ONTARIO

★ Dominion Magnesium, Ltd, controlled by Ventures, Moneta, God's Lake, and Bobjo Mines, has formed the subsidiary Light Alloys, Ltd., to carry on a foundry business. The production of finished magnesium castings is the major business of the company, with substantial exports to the United States, Mexico, Great Britain, Belgium, and other countries. It is planned to resume operation of the reduction works at Haley, and there to produce also metallic calcium, barium, and strontium. J. D. Barrington is general manager.

★ Delnite Mines, adjoining the Aunor, in the Porcupine camp, reports that drifting on the 2,500-ft. level has opened ore sections in four parallel veins. In 900 ft. of drifting, $13 ore has been exposed for a length of 750 ft. over a 4.5 ft. width. This new depth development is stated to be the most important ore found in the mine to date. From the 2,500 horizon up to the 1,750-ft. level work has not advanced far enough to trace the continuity of the vein system, which may be found to be an extension of the Aunor deposits. The grade is considerably better than ore developed in the upper Delnite workings. A 500-ft. section remains to be explored before bringing these workings up to the Aunor boundary. The mill rate is now at about half capacity, because of the

labor shortage. John Beattie is mine manager.

★ Hollinger Consolidated Gold Mines reports production at the property of the subsidiary Ross Gold Mines averages about 200 tons a day. Ore is being pulled from old stopes above the 900-ft. level and from development faces on three new deep levels. The labor shortage continues at both the Ross and Hollinger mines, which require more than 500 men. John Knox is consulting engineer.

★ John Drybrough, president of Berens River Mines, reports production in the nine-month period ended Sept. 30 was 36,025 tons averaging $18.81 a ton, including gold, silver, and lead. Operating costs amounted to $14.70 a ton, which can be reduced when the present mill rate of about 100 tons a day is doubled to capacity. The company plans to put down a 400-ft. winze to a depth of 3,100 ft. and to open two new levels. Ore similar in value to the mine average has recently been opened for a length of 160 ft. on the 2,700 level. A downward continuation of the vein has been indicated by a series of eight diamond-drill holes. Lateral work is being continued on the 2,500-ft. level. C. W. McDonald is mine manager.

MANITOBA

★ The annual report of Central Manitoba Mines, Ltd., for the year ended Aug. 31, 1946, states that approximately $20,000 was spent on the exploration of new properties. Diamond drilling on the company's group of claims west of the San Antonio mine was suspended after five holes totaling 3,142 ft. failed to yield encouraging results. An option on the Tut group of claims, about two miles southwest of the former Gunnar mine, was dropped after the completion of seven holes, totaling 1,004 ft. In the Island Lake area, in partnership with three other companies, 5,244 ft. of drilling was done in nine holes. Some drilling was also undertaken at Wallace Lake, east of Rice Lake, without favorable results. A party of three geologists was engaged during the latter part of the season in the vicinity of the nickel and gold discoveries near Barrington Lake, in northern Manitoba. The balance sheet at the end of the fiscal period shows current assets amounting to $281,824 and liabilities of $1,312.

★ Mining operations at the Josephine Iron Mine north of Sault Ste. Marie, Ont., in which Sherritt Gordon Mines, Ltd., is the largest shareholder, have been suspended due to a collapse in the east end of the orebody extending from the surface to the sixth level. The resultant influx of mud and water has filled the mine to within 30 ft. of the fifth level. The caving is believed to have been caused by a cavity along a fault in the east end of the orebody. Eldon L. Brown, president of Sherritt Gordon Mines, states that the elimination of the exchange on the

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★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

"SSS" is a strong, durable belt with a reputation for low-cost performance on the roughest, toughest conveying jobs. Designed for handling ores, run-o'-mine coal, crushed limestone up to 8", rough slag and similar materials, wet or dry. Specifications for cover thickness, number of plies, weight, etc., determined by individual job requirements. Can be supplied endless and in step-ply construction if desired.

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Factory—Trenton, N. J. Established 1870

Canada (*continued*)

Canadian dollar completely altered the situation and that the mine has not been making a profit of late. Therefore it is improbable that the mine will be rehabilitated. In the meantime shipments from stockpile are continuing to Algoma Steel Company.

★ As anticipated for some time, operations of the East mine of Sherritt Gordon Mines, Ltd., at Sherridon, have ceased due to the exhaustion of ore.

★ Sinking at the Ogama-Rockland Gold Mines, Ltd., property, west of the former Gunnar mine, in the Long Lake area, is making good progress. The station has been cut at the 250-ft. level and sinking has passed the 300-ft. mark. Lateral work is expected to be under way before the end of the year. The complete surface plant of the Gunnar mine is on the property, and a large part of the equipment of the Gunnar mill is available if development justifies its installation. Previous surface drilling indicated two oreshoots, both of which yielded high values over narrow widths. The operation is presently employing 70 men under the management of J. N. Botsford. Work is now proceeding on a road which will connect the property with the San Antonio mine to the northwest. Completion of this road will be of great assistance in the transportation of supplies and equipment.

★ The Bankfield-Lake Fortune-Towagmac group, which acquired claims in the vicinity of the Sherritt Gordon nickel-copper discoveries at Lynn Lake, is planning a diamond drilling program early in 1947 to explore encouraging magnetic anomalies.

★ The Valley Vein shaft of Kiwago Gold Mines, Ltd., adjoining the Ogama-Rockland property to the north, is now at a depth of 270 ft. Some 500 ft. of lateral work has been completed on the 125-ft. level and approximately 100 ft. on the 250-ft. level. The company is preparing to sink another shaft on the Rex deposit north of the present operation.

BRITISH COLUMBIA

★ Work has resumed at the Howe Sound Co.'s Britannia copper mine following acceptance by the management and employees of strike settlement proposals recommended by the industrial disputes commissioner, Chief Justice Gordon McG. Sloan. The Britannia operation is now working three shifts, with about 200 men employed and others being taken back at a rate of about ten per day.

★ At Copper Mountain, representatives of the Granby Consolidated Mining, Smelting & Power Co. and of the I.U.M.M. & S. W. have finally reached agreement on hours of work following prolonged negotiations. It is expected work will be resumed at the mine and at the Allenby concentrator without further delay.

★ The Sloan recommendations for settlement of the long-drawn-out strike of metalliferous mine workers have been effective in the case of the copper mines, but to date have not brought about a settlement of the gold-mine strikes. The principal reason is that a guaranteed copper bonus of 50c. per shift will be paid the copper miners over the next nine months in addition to the basic wage increase of 64c. per shift for miners and timbermen and 48c. per shift for other employees. There is no provision in the Sloan settlement plan for an equivalent bonus or compensating additional wage increase for gold-mine employees. Both groups of mine workers would receive shift differential pay of 3c. per hour in the second shift and 5c. per hour in the third shift; hours worked in excess of 44 in any one week would be paid for at time and one-half; and check-off provisions would be enforced.

Following publication of the Sloan recommendations relating to the gold mines, modified acceptance was indicated by both operators and employees. The operators informed the commissioner that they were prepared to accept the provisions subject to negotiation of the check-off terms. Union representatives recommended to their membership acceptance of the proposals with exception of those pertaining to basic wage increases which were considered inadequate. The union membership indorsed this stand by a large majority.

In a further effort to terminate the strike, the commissioner then suggested to both operators and employees that the men return to work pending arbitration of the check-off and the wage questions. Although this suggestion met with the approval of striking employees, the gold-mine operators stated that they were unable to concur for the reason that they had already gone as far as they could possibly go in agreeing to the wage recommendations proposed by Chief Justice Sloan. It is reported that further discussions with union representatives are being carried on at Bralorne and Hedley Mascot mines.

★ Work has been resumed at the Sheep Creek Gold Mines subsidiary, Zincton Mines, Ltd., which has been closed since the mines strike of last July 3. A. E. Jukes, president, says that favorable metal prices have made it possible to settle on the basis of the terms accepted by the copper mines. A crew of 45 men is now employed, and it is hoped that labor conditions will permit doubling the force soon.

★ Operations have also been resumed at the Silverton mine of Western Explorations, Ltd., with 25 men back at work. The mill will be operated on a 100-ton daily basis as soon as sufficient ore has been broken and the company is assured of the services of a minimum of 75 men. All men will be placed on work contracts with incentive pay to advance development headings as quickly as possible. Im-

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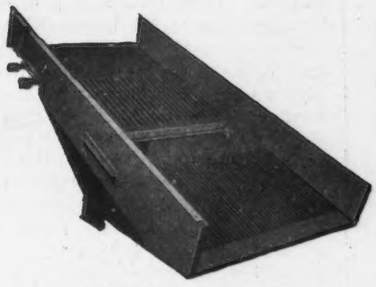

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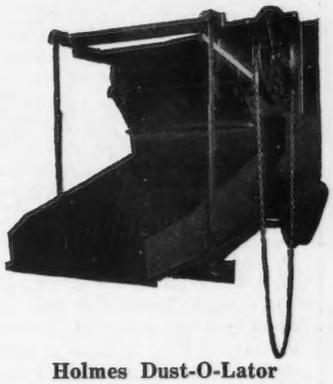

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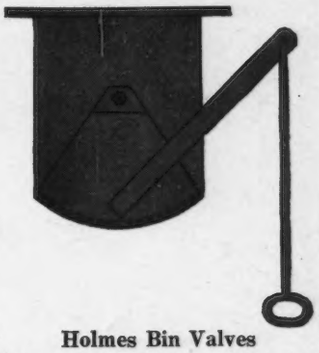

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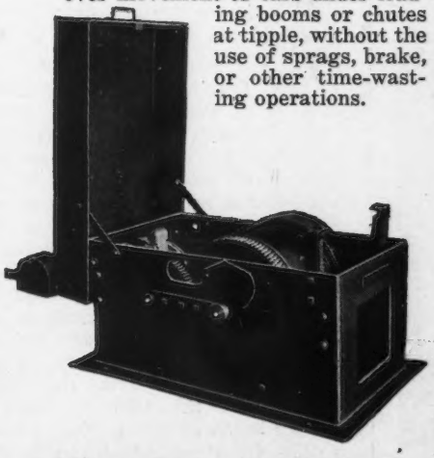

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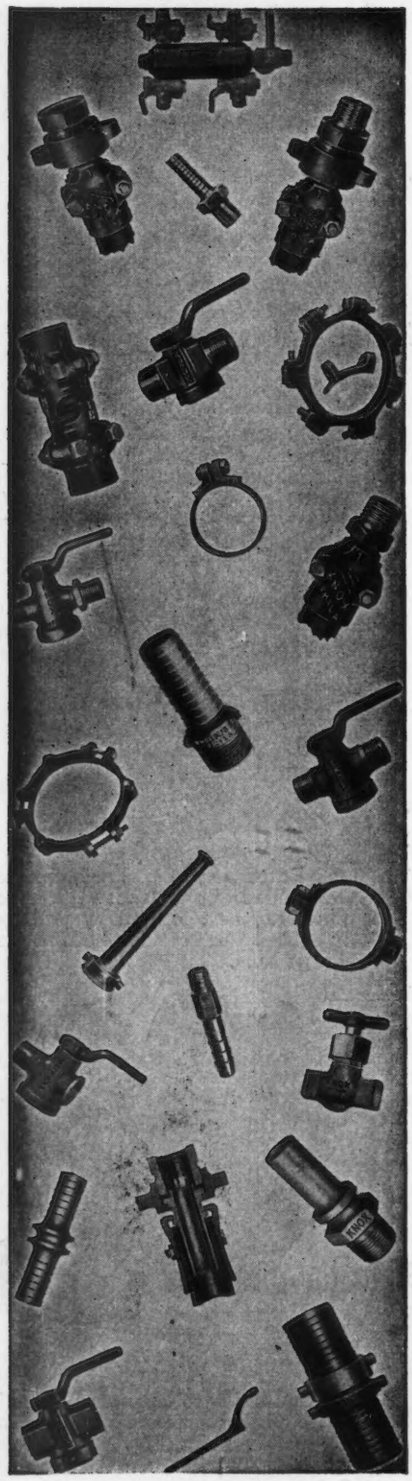

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Canada *(continued)*

proved prices for silver, lead, and zinc have increased by about 30 percent, the value of concentrates stored over the past few months.

★ Employees of Polaris-Taku have gone on strike following a breakdown of negotiations for increased pay and other concessions. The management had reached an agreement with employees that whatever settlement was agreed upon between Bridge River district operators and employees would be made effective at the Polaris-Taku operation retroactive to last August. When terms of the Sloan recommendations were made public, however, the employees requested an immediate meeting with the management at which concessions approximating an 80 percent increase in "take-home" pay were demanded. The company's offer of increases aggregating 30 percent was rejected.

★ J. G. Turgeon, president of Duthie Mines (1946), Ltd., has advised shareholders that ore of an estimated value of one million dollars has been indicated in the first ten diamond-drill holes driven this year. This indicated ore does not include any of the high-grade ore made available through rehabilitation of old working faces. A telegraphed report from Lieut.-Col. C. B. North, resident manager, states in part: "On preliminary inspection of underground workings, backed up by assays from the mill level and good-looking samples from the McPherson level, it is my opinion that the mill can be started up on ore taken from the old stopes while the drive is on to the Canary zone. Stopes 500G, 500F, and 65A look very good. It is apparent, that a lot of good ore has been left in these stopes, probably on account of the low prices of silver, lead, and zinc obtaining during the time of the last operation."

Acting on the resident manager's advice, the Duthie company is prepared to commence milling within the next 45 days.

★ The lowermost, or 1,700-ft., level at the Tranquil Creek (Fandora) property of Privateer Mine, Ltd., has been advanced more than 226 ft. In the last 80 ft. reported, samples taken have shown an average of 1.12 oz. gold per ton across an average width of 1.62 ft. The last face reported showed a face of 1.70 ft. assaying 1.90 oz. gold per ton. According to N. E. McConnell, managing director, the face of the 1,700-level drift is now almost vertically below the 1,900-level portal and gives indications of comparing favorably with the higher horizon. On the 1,900-ft. level, an orebody has been opened over a length of 450 ft. from which an average sampling width of 1.77 ft. assayed approximately one ounce gold per ton. At Privateer's Zeballos operation, closed since last spring due to a fire which destroyed the power house, one of two recently acquired 375-hp. generating units and the main compressor are again in operation. The underground crew is being built up as rapidly as possible and it is expected full-scale operations will be resumed this month.

★ Following an inspection of work at the property of Surf Inlet Consolidated Gold Mines, Ltd., Princess Royal Island, Charles Mentzel, New York consulting engineer, has expressed the opinion that recent developments at the Pugsley mine are of major importance. Intersection of an 8-ft. vein averaging 1.43 oz. gold per ton on the 13 level was reported recently. This ore lies 380 ft. below any previous development. In the course of his inspection trip, Mr. Mentzel also examined the McVicar group of 12 mineral claims located close to the Britannia mine, recently acquired under option by Surf Inlet. A total of 24 additional adjoining claims have been staked. Geological structure is reported as similar to that obtaining at Britannia. William H. Hax, president of the Surf Inlet company, states that ore on the newly acquired property can be extracted profitably at present metal prices. The claims cover a strike along a broad shear zone for a distance of approximately four miles. Intense alteration and silification of the host rock is evident. Of 23 samples taken, 11 returned values exceeding $10 per ton with copper at 10c., lead and zinc at 5c., silver at 90c. and gold at $35.

★ Described as a new and important phase of the development program being carried on by Dentonia Mines, Ltd., at the company's Greenwood property, unwatering of the old Jewel shaft has been started preliminary to resampling the old workings and resumption of development in that sector. The drift being continued southward from the Enterprise workings on the Jewel vein is approximately 200 ft. from the old Jewel workings. It is planned to consolidate operation of the two mines to expedite development. The Jewel workings are stated to have produced profitably prior to 1916, when gold brought only $20.67 per ounce.

★ Pellaire Mines, Ltd., Taseko Lake district gold prospect, has responded favorably to the development program being carried out by Quebec Gold Mining Corporation. Following preliminary diamond drilling during 1945, the road to Taseko Lake was reconditioned this year and, with assistance from the British Columbia government, an additional 18 miles of road was constructed from the south end of Taseko Lake to the mine. Three principal veins, Nos. 3, 4, and 5, have been opened up on the surface, and adits have been started on each of these veins. Surface sampling on the No. 4 vein across a width of 5.5 ft. returned 0.56 oz. gold per ton; on the No. 5 vein, a sample taken across 20 in. assayed 1.6 oz. gold per ton. Samples across 3-ft. sections over an aggregate width of 21 ft. on the No.

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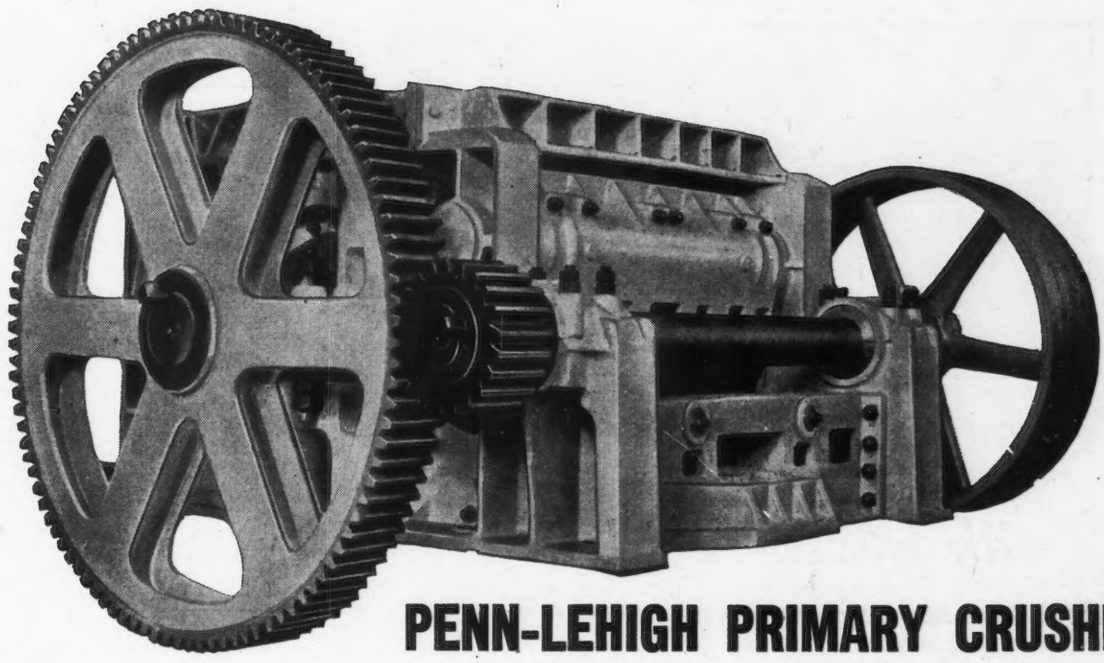

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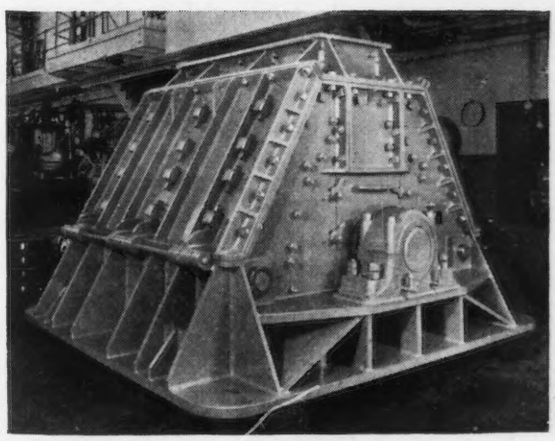

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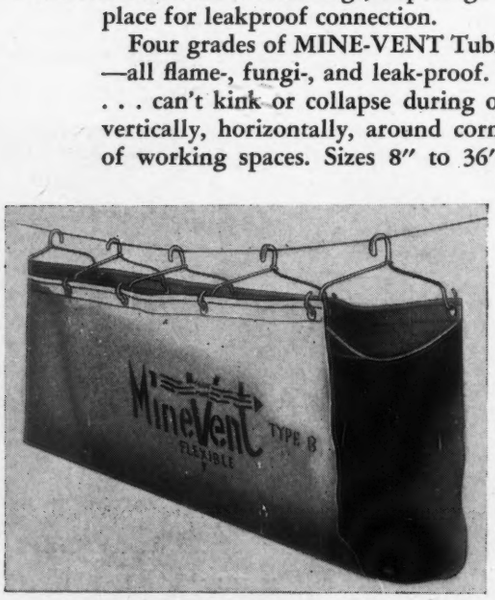

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Canada *(continued)*

3 vein assayed as follows: 0.12 oz., 1.68 oz., 0.56 oz., 0.58 oz., 0.28 oz., 0.16 oz., and 0.82 oz. gold per ton. The drift on the No. 3 vein has shown the following results in samples taken from the face at 70 ft., and at intervals of 5 ft. from the face back toward the portal: 4.8 ft., 0.29 oz.; 5.2 ft., 0.19 oz.; 7.0 ft., 0.66 oz.; 6.0 ft., 0.42 oz.; and 5.5 ft., 0.22 oz.

★ With more than 100 tons of freight flown to the Salmon Gold property of Morris Summit Gold Mines, Ltd., sufficient supplies and equipment are now on hand to meet all requirements of the development crew. The low-level crosscut being driven to investigate the large body of high-grade ore indicated by diamond drilling has been advanced more than 400 ft. It is expected that the objective of 1,700 ft. will be attained by next spring.

★ H. D. Forman, manager, has advised that Mining Corporation of Canada's Base Metals operation at Field, B. C., will be closed indefinitely. This decision, Mr. Forman states, has resulted from the indefinite nature of the mines strike situation and the present labor shortage. Work will start soon on the Toric property at Alice Arm, recently acquired by Mining Corporation. A crew will be employed reconditioning the road to the property and this work will be continued as long as weather conditions permit.

YUKON

★ Yukon Explorations, Ltd., incorporated to acquire placer-mining leases and properties in Yukon Territory formerly held by Sunshine Mining Co., intends to complete the development plans projected by the former owners and to obtain production as soon as possible. All dredging, hydraulicking, stripping, thawing, and other equipment that is needed to bring the properties into production has been acquired or purchased. For the present, efforts will be concentrated on production by dredging operations from proved gravel reserves. Funds are being provided, in addition to the amount required to bring the main properties into production, for a program of general exploration throughout the Yukon Territory, specially directed toward acquisition of other placer deposits.

Partly explored ground consisting of 5.5 miles on Sixtymile River and 2 miles on the tributary Big Gold Creek was drilled in 1940 and 1941 by George B. and Harry Murphy, of the Idaho-Canadian Dredging Co., predecessor of the Sunshine operation. An estimate of presently proved reserves amounting to 3,100,000 cu.yd. averaging 58c. per cubic yard has been made by Franklin L. C. Price, managing director of Yukon Explorations. Mr. Price states: "The main sections of the property have been drilled, using Hillman placer-drilling rig and standard 6-in. casing. Open holes were

drilled in the frozen ground and volumes were calculated by water-displacement measurements. This is the standard practice used in evaluating placer deposits of this type. In calculating the average values of the drill holes and dredging ground, a fineness of 800 was used for gold. A composite sample of the gold recovered from Big Gold Creek during the testing operations was analyzed and showed a fineness of 850. This is regarded as an additional safety factor in calculating average gold values. If a fineness of 850 is obtained from gold recoveries over the whole dredging section, it would have the effect of increasing the recoverable value of the gravel reserves by $115,000.

The company's bucket-line dredge now in storage in Dawson will be assembled on the Sixtymile ground during 1947 for test runs.

★ G. Goldthorp Hay, of London, England, president of the Board of Directors of Yukon Consolidated Gold Corporation, which operates dredges in the Klondike area, stated in Dawson this fall that the Yukon company had used all surpluses and a million and a half dollars of borrowed money during the past few years. He said the company would expend a quarter million dollars in meeting the new demands brought about by the settlement of differences between the union and the company. This, he added, would force the company to postpone the ordering of a new dredge.

★ Brown McDade Gold Mines, Ltd., has been incorporated by a financing group including Karl Springer, president of Leitch Gold Mines, Ltd., and Leta Explorations, Ltd.; W. B. Milner, president of Taku River Gold Mines, Ltd., Transcontinental Resources, Ltd., and Yukon Explorations, Ltd.; and W. F. James, consulting geologist. The new company has been formed to finance development of a gold-silver lode property about 100 miles north of Whitehorse. Preliminary work done by Yukon Northwest Explorations, Ltd., established a strong zone of shearing and indicated a principal mineral zone estimated to measure 900 ft. long and 15 ft. wide, with samples assaying 0.4 oz. gold and 3.0 oz. silver per ton. A second vein carrying similar values over a width of 6 ft. parallels the main vein for 200 ft. Present plans call for a diamond-drilling campaign and 2,000 ft. of underground development.

MEXICO

Silver miners demand new wage increases—Silver-lead mines in Nuevo Leon reopen

★ Danger of another strike against the silver-mining and silver-treating companies appears to have been removed with the granting of a further

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The handling of sand, gravel and crushed rock imposes drastic shock loads and heavy abrasive wear on the chain, sprockets and buckets employed.

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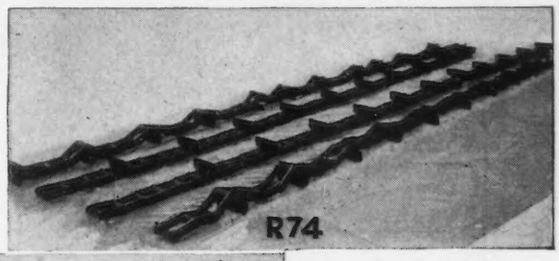
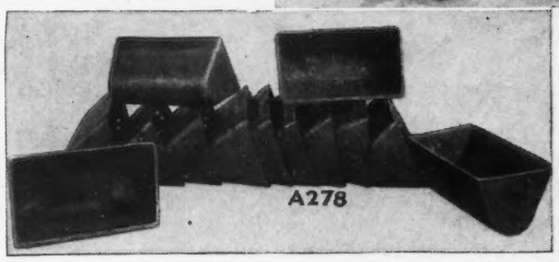
The two most important requisites in elevator and conveyor chain—durability and freedom from breakdown—find their highest development in Amsco Manganese Steel Chain. Having a test-bar tensile strength of 100,000—130,000 lbs. p.s.i. and a developed-in-service hardness up to 550 Brinell, combined with a tough shock-resisting body-metal, manganese steel chain withstands for long periods abuse that quickly destroys ordinary chain.

Examples of three, five and even ten-to-one service life for Amsco chain are on record.

Sprockets, and idlers, too, of manganese steel have an assured service life greater than those of ordinary metal. They add length of life to transmission chains through taking on a smooth polish in operation. In a typical application where gray iron sprockets had to be replaced every few months, Amsco sprockets showed very little wear after three years in service.





R-74. 70' of No. 111 manganese steel conveyor chain with F-2 attachments for sand and gravel plant application.

A-278. A group of Amsco manganese steel elevator buckets punched for chain attachment.

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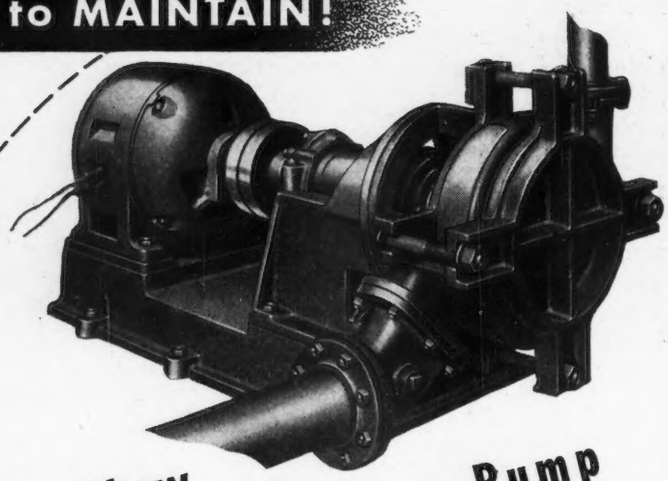

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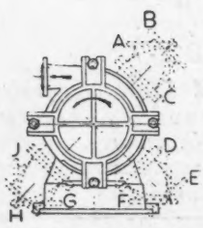
Impeller easily removed.

3. *You can remove the impeller and liner without disturbing piping.*



72 different nozzle locations.

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Mexico *(continued)*

substantial pay hike by several of these enterprises which have deferred to the recent presidential decision that the 21c. profit increase estimated to accrue to the companies from the U. S. boost in price to 90.5c. must be shared three ways by labor, the Government, and the companies. The miners' union had announced in paid newspaper advertisements that it would call a strike unless the silver firms allowed a new higher wage, recalling the two-months' strike begun Dec. 31, 1945, which won a 25 percent pay increase on the basis of the advance in silver price from 45c. to 71.111c. Miners in some silver towns, among them Pachuca, in Hidalgo, showed restlessness that bordered on disorder.

The Labor Ministry announced the following settlements in this case: San Francisco Mines, San Francisco del Oro, Chihuahua: 1.75 pesos a day base increase for 2,200 employees; San Luis mine, Tayotitla, Durango: 1.91 pesos for 400 employees; Cia. Santa Maria de La Paz y Anexas, Matehuala, San Luis Potosi: 1.95 pesos for 900 employees; Peñoles: 1.60 pesos for 2,000 employees; and The Fresnillo Company, Fresnillo, Zacatecas: 1.65 pesos for 3,000 employees.

In an interview at his private residence, officers of the miners' union urged President Camacho to order a general pay rise for workers of lead, copper, and zinc companies proportionate to the increase he ordered for the silver workers, because of higher prices of the three metals and what they described as the constantly soaring cost of living in all mining centers of Mexico. The President turned the union officers' appeal over to the Labor Ministry for examination and report. The appeal contained no strike threat, but reports are that unless the lead, copper, and zinc miners are granted their demands, the union will call a strike.

★ The union has appealed to the Labor Ministry to correct what it calls the deplorable economic condition of 300 miners working in Mineral de Orofeo, Michoacan, due to the "unbelievably low" daily wage of 2.50 pesos (53c.). The union claims this mining camp is a good producer, enjoying high profits from today's record-high prices for metals, but that its pay scale continues to be that of 10 to 15 years ago. The Ministry is investigating the complaint.

★ Mexican mining has entered one of its greatest bonanzas, thanks to the 90.5c. price for silver and higher rates for lead, copper, and zinc, reports the National Bank of Mexico in a survey of the nation's No. 1 industry. It calls the three-way share of the profit from the new price "equitable."

★ Although several mining products were included in the freight rate increases the Ministry of Communica-

tions and Public Works allowed the railroads as of Jan. 1, 1946, the national railroad workers' union is clamoring for a new rise in these rates for the Government-administered National Railways, Mexico's largest railroad. Contending that the railroad hauls many mining products at rates that apply to "simple cereals," the workers argue that charges for the metals in question must be increased in proportion to the new prices for them. The union declared that higher freight rates for higher-priced metals would be a substantial contribution to improving the Railways' economic condition, and naturally toward gaining for them another pay increase. Low freight rates on mining products, the union asserted, has lost the Railways more than 25,000,000 pesos during the past ten years, and more than 50,000,000 pesos since this "privileged position" was established nearly 40 years ago, when the Railways was organized with the consolidation of several roads. The union charged that the low freight rates for metals of which it complained largely benefits foreign mining companies. This is one of the periodical clamors of the union for higher freight rates on mining products, which seems to be part of its campaign to obtain higher pay for its members, claimed to number about 53,000.

★ Indicative of the strong comeback of the Maguarichic district, Chihuahua, in the Sierra Madre, about 200 miles northwest of Chihuahua City, is the start of construction by the Beneficiadora Napoleon Fa of a 50-ton custom mill which will treat gold, silver, and lead ores of the district. Road construction, to be intensified with the end of the rainy season late in October, will greatly improve transportation conditions for the Maguarichic district.

★ The Public Health and Welfare Ministry, in cooperation with the Guanajuato Government, is arranging a "home ground" for the children of tubercular or silicotic miners on a ranch near Guanajuato City, to protect the offspring from those diseases. This will be the first "home ground" of its kind in Mexico, and will have a clinic for the periodical examination of the children. It is understood that the Ministry will establish similar protection for the children of miners in other mining regions.

★ The Federal Supreme Court has rendered the precedent-setting decision that bronchial pneumonia must be regarded as a professional disease for miners, entitling its sufferers to cash and other compensations along with silicosis. In allowing compensation to the widow of a miner who died of bronchial pneumonia, proved to have been contracted while in the employ of the Cia. Minera Real del Monte y Pachuca, S.A., Pachuca, Hidalgo, the court upheld the widow's appeal from the decision of the Federal Board of Conciliation and Ar-

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Mexico (*continued*)

bitration that she had no claim against the mining company because bronchial pneumonia is not a professional disease.

★ High silver and lead prices have brought resumption of work in the long-idle Guadalupe, Ampliacion de Guadalupe, and La Voladora mines, Lampazos Municipality, and Mina de Agua mine, Cerralvo Municipality, Nuevo Leon, according to reports from Monterrey. Work is expected to resume soon in several other mines in Nuevo Leon, the reports added.

DUTCH GUIANA

British Columbia company will develop Janapow holdings

★ Janapow Gold Mines, Ltd., with capital of 3,000,000 shares of 50c. par value, has been incorporated in British Columbia to develop and operate mineral holdings in Dutch Guiana. Egil H. Lorntzen, president of the Janapow company, states that on one concession, near Janapow Creek, a 6.5-ft. vein has been trenched in a series of open cuts along a length of 2,000 ft. Values of 10.0 oz. gold per ton are frequent, he reports, and in one instance a 14-in. strip assayed 33.2 oz. A 10-ton mill has been purchased and is now at the property. All work at the company's properties is under the direction of K. N. Nordlund, British Columbia mining engineer.

PERU

Banco Minero studies Hualgayoc region—Zinc plant projected at Chimbote

★ The region of Hualgayoc, near Cajamarca, about 200 miles inland from the port of Pacasmayo, has recently been studied by a technical party sent by the Banco Minero del Peru. Hualgayoc has been exploited since the time of the Incas, and it is believed that a large part of the silver used for ornaments in the northern section of their empire came from those mines. Later the Spanish conquerors worked the rich outcrops intensely, also exploring the lower parts of the formation by means of a 2,500-ft. long adit which is still intact.

In recent times Hualgayoc has been worked on a small scale, and three years ago the first modern concentration plant was erected by a group called Compañía Explotodora Minas San Agustín. This plant has a capacity of 80 tons a day and is equipped for selective flotation; it is powered by a 750-kw. hydroelectric plant. At present the plant is treating only 40

tons daily, because of a shortage of ore. Two other small flotation plants of obsolete design, with a capacity of 20 tons each, are not functioning.

Although the upper parts of Hualgayoc show remnants of high-grade silver and lead veins, the possibilities of developing ore are slight. The Incas and Spaniards were interested only in those sections close to the outcrops, as their only means of treatment was amalgamation, limited to oxides. As soon as the workings entered sulphides in depth, they stopped. The adits which cut the many veins of the region in the sulphide zone have not been used to open up this lower zone, and good possibilities exist for its development. At present the mine owners lack the capital for such an undertaking. The Banco Minero plans to finance the project in part, and perhaps to establish a branch for the sale of mining materials as well as furnish technical personnel to supervise the work.

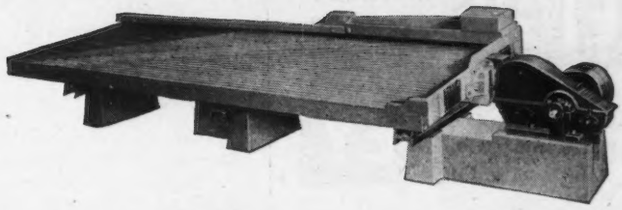
★ A United States concern engaged in geophysical prospecting has been working in Peru during the last eight months, with reportedly successful results. Geophysical methods, practically new in Peru, give promise of having important applications.

★ The Corporación Peruana del Santa plans to install an electrolytic zinc plant at or near Chimbote, using hydroelectric power from the Cañón del Pato plant, at present under construction. The zinc plant, besides handling zinc concentrates from the central region, has a potential source of metal in the Jecanca area, near Huaras, about 120 miles east of Chimbote.

PHILIPPINES

Big Wedge expected to produce by January—Lepanto mill and smelter to be rebuilt

★ Reports have been received from Atok engineers that the Big Wedge mine will send ore to the 400-ton mill by Jan. 1. The delay in resuming production has been almost entirely due to inability to obtain needed repairs and other equipment from strike-bound plants in the United States. The Big Wedge mill, though surviving the occupation years almost unscathed, suffered considerable loss from looting. Orders were immediately given for replacements, but these have arrived with distressing slowness. In the meantime the interior shafts have been repaired and the lower levels restored. Highgrading of the ore, which was carried on by the natives during the occupation, does not appear to have occasioned excessive losses. Douglas Strachan, formerly mine superintendent at the property, returned to resume this position six months ago, and Frank



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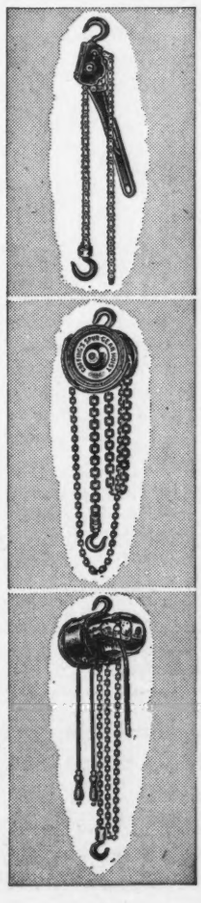

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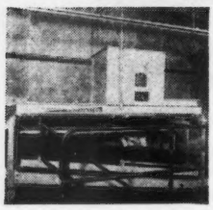

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Philippines *(continued)*

Morehouse, formerly general manager, has also returned from San Francisco. Paul Meyer is president of the company.

★ Clean-up and rehabilitation work is reported at the Baguio Gold Mining Co. property, formerly one of the principal producers in the Baguio field. Frank E. Delahunty, formerly assistant superintendent at the mine, who remained in the Philippines after internment by the Japanese, is in charge of rehabilitation work. Though it is not possible to make a complete report, his observations are optimistic.

★ When the Japanese gave up the Lepanto copper mine, in northern Luzon, after their last desperate stand in Mountain Province, they left behind them about 8,000 tons of copper-gold concentrates in the bins at the mine and at San Fernando. This ore, valued at about one million pesos, is to be sold and the company will use the proceeds to undertake rebuilding the 400-ton mill and smelter, which were totally destroyed. It is also believed that two freighters loaded with additional ore were sunk in shallow water near San Fernando, with a good chance now of salvage. The Lepanto mine, intensively worked by the Japanese during the occupation, appears to be in fairly good condition underground.

★ Reliable reports indicate that the Baguio miners are anxious to cooperate in rehabilitation work and are accepting the prewar wage scale of 1.5 pesos per day provided they can secure rice at prewar prices. The companies working in the area are furnishing rice to their men on this basis and making good the difference in cost. This naturally amounts to a substantial increase in pay to take care of the higher living costs, but has obvious advantages over an increase in peso wage rates.

★ Little activity is reported in the Paracale and Masbate gold districts. It is believed that the Masbate Consolidated mill will accept custom ore for milling from other mines in the island, notably IXL, the entire surface equipment of which was destroyed.

★ The Tambis gold dredge, which formerly operated south of Surigao, on Mindanao, is reported to be in good condition, and resumption of dredging is planned at an early date.

AFRICA

Odendaalsrust borehole results announced—High costs seen as critical problem

★ Silence continues to reign in official circles over the fate of applications for new mining leases. Beyond a general admission that the Mining Leases Board is now dealing with several applications, it is not possible to obtain information from the Government. The companies concerned admit that they have applied for leases, but said they have no information. As far back as January, West Witwatersrand applied for a lease over the Doornfontein-Varkenslaagte area, and on July 3 the Africal European Investment Corporation applied for leases to work three mines in the Block 7 area of the Free State. These four applications are concerned with future large-scale mining.

★ The working profit of Blyvooruitzicht Gold Mining Co. for the year ended June 30, 1946, amounted to £538,909, compared with £196,975 in the previous year.

★ The Eersteling gold fields near Marabastad, which were first worked in the days of the South African Republic, are being reopened.

★ The directors of Free State Development and Investment Corporation have issued the following report:

Borehole P.P.1., on farm Philippi 895, approximately 2 miles west of Odendaalsrust, has been stopped at a borehole depth of 4,149 ft. in measures which are considered to lie in the footwall of the Basal reef. An unconformity was encountered at a borehole depth of 3,753 ft., and no intersections of Basal or Leader reefs were obtained.

Borehole W.T.4, on farm Weltvreden 59, approximately 3 miles north-northeast of Odendaalsrust, drilled by this company on joint account with the Central Mining & Investment Corporation, has been stopped at a borehole depth of 4,843 ft. Reef "A" was intersected at 4,355 ft. and assayed 2.6 dwt. over 9 in. Reef "B" was intersected at 4,598 ft. and assayed 9.0 dwt. over 18 in. At 4,637 ft. faulting was encountered and the holes passed into measures which are thought to lie in the footwall of the Basal reef. The Basal reef and Leader reef have therefore been faulted out, and no intersections of those reefs were obtained.

Borehole W.T.3., on subdivision 4 of farm Weltevreden 59, approximately 3¼ miles northeast of Odendaalsrust, drilled by this company on joint account with the Central Mining & Investment Corporation, Ltd., and African & European Investment Company, Ltd., has been stopped at 5,045 ft. The "A" Reef was intersected at 4,040 ft. and assayed 8.1 dwt. over 6.5 in. The "B" reef was cut at 4,299 ft. and assayed 3.2 dwt. over 12 in. The Leader reef was intersected at 4,811 ft. and assayed 3.2 dwt. over 8 in. The Basal reef was cut at 4,873 ft. and assayed 8.2 dwt. over 5.9 in. Recovery of core was good. The borehole is being deflected to obtain a second intersection of the Basal reef.

Borehole H.T.2, drilled by this company on joint account with the Central Mining & Investment Corpora-

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Blake Type
Fig. 1

Overhead Eccentric Type
Fig. 2

KUE-KEN Crusher
Fig. 3

SEALED LUBRICATION. Since the introduction of jaw crushers some 80 years ago, one of the most neglected points has been the bearings and their lubrication. These old designs, with inherent excessive bearing pressures and poor lubrication systems, compel the use of remedies such as water-cooling, extremely slow speeds, etc. We have seen popular makes of crushers in the field where the unfortunate operator, in sheer desperation, has installed an open "drip" system over each bearing, all being connected to a barrel of oil. Excessive bearing pressures plus the stream of rock dust and oil that is fed into the bearings by this crude method soon destroys the bearings and the shaft. These old designs are still being offered as *modern equipment.*

Now consider KUE-KEN crushers with their really modern design which reduces bearing pressures to one-fifth of those present in ordinary crushers. Then, in addition, all toggles and mechanism are enclosed in a dust-tight, oil-tight case.

Referring to figures 1 and 2 again, note that there is considerable raising and lowering of the pitmans on each stroke. These parts are heavy and unbalanced and must be run slowly. Heavy flywheels which are added to these machines only hide these destructive unbalanced forces from you and put additional loads on the already overloaded bearings. In the KUE-KEN crushers with their pendulum type jaws, there is practically no lifting and each reciprocating part is counterbalanced by another moving in the opposite direction to cancel out unbalanced forces. A single light flywheel and minimum foundation requirements are proof of the smooth running balance of KUE-KEN crushers.

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KUE-KEN crushers are available in the following sizes: 12″x6″, 16″x8″, 24″x10″, 30″x15″, 36″x20″, 42″x25″. Other sizes will be available soon.

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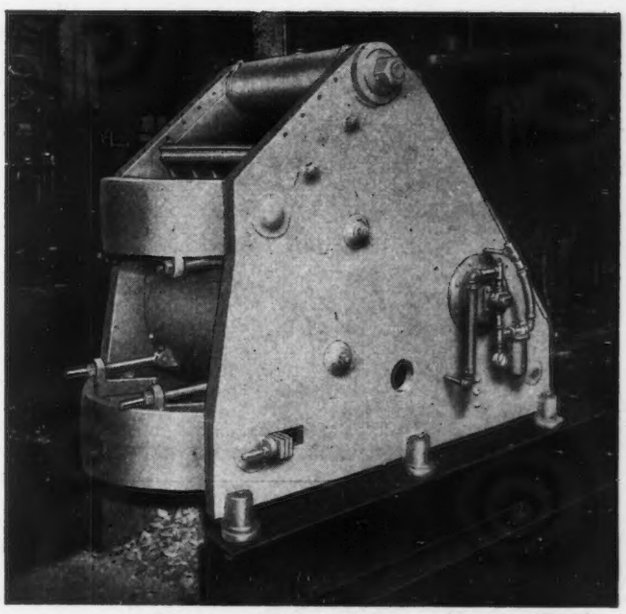

Above is shown a 30″x15″ KUE-KEN Simplex crusher. This view is from the pump side showing the accessible oil pump and filter. The hinge pin is enclosed in a separate sealed oil bath. All toggles and other mechanism run in a sealed and filtered oil bath.

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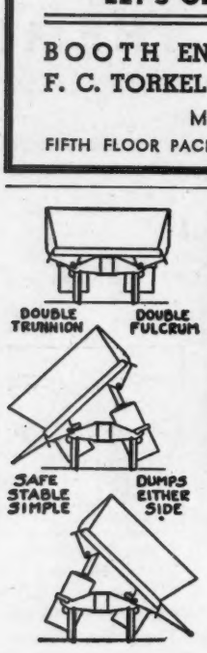

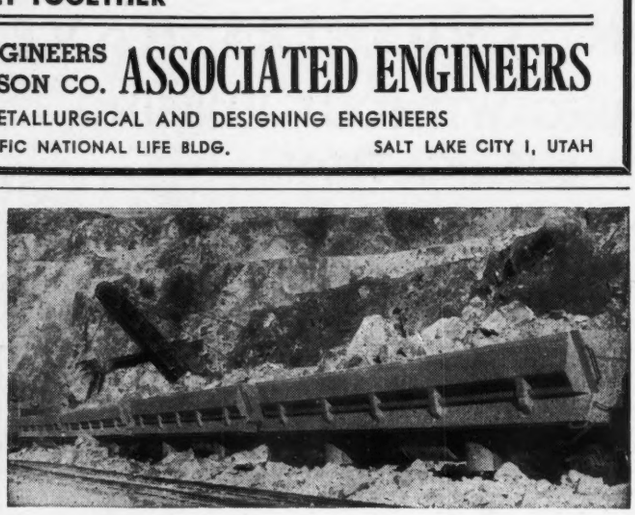

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Africa *(continued)*

tion, Ltd., on the northern boundary of Farm Hilton 530, approximately 7 miles northeast of Odendaalsrust, has been stopped at borehole depth of 1,176 ft. From the surface to 777 ft., the borehole passed through Karroo beds. From 777 ft. to 889 ft. 3 in. of fault zone occurred and measures thought to lie in the footwall of the Basal reef were cut. The borehole was stopped in these measures.

★ The Tanganyika Department of Lands and Mines has announced that the Williamson diamond mine, discovered at Shinyanga during the war, has a surface area at least eight times that of the largest diamond mine at Kimberley. It was found by Dr. John Thorburn Williamson, a Canadian geologist. The deposits are valuable, but there is nothing yet to suggest that the find will compare with the original discoveries at Kimberley. The mine is handling several hundred tons of diamond-bearing gravel a day, and machinery on order will more than double production. The available depth of diamondiferous ground is still unknown, for so far only the surface has been scratched. The largest diamond found to this date weighs 135 carats.

The surface area of the mine has been thoroughly trenched. The area of the pipe of blue ground associated with the presence of diamonds is about four and a half times that of the Premier mine. The diamonds being recovered are from gravel lying on top of the pipe and from tongues emanating from the pipe. Conclusions should not be hastily drawn, however, that the existence of a pipe of blue ground necessarily indicates the presence of diamonds in large quantities. Of 45 other pipes discovered at various times in Tanganyika, none has proved payable over a period.

As to the estimated value of the Williamson mine's output, the total export quantity of diamonds from Tanganyika for the first six months this year was 47,762 carats, worth about £521,000. This gives a total value of about £1,000,000 for the year, of which the Williamson mine provides the bulk.

★ The arbitrator has issued his award in the dispute between the rock breakers on the Copperbelt and the mine managements. Shaft sinkers are not included. For all other rock breakers and pattern drillers' wages should be paid according to contract rates, except that there should be a reduction of 5 percent (1s. in the pound) at the Mufulira mine; 12½ percent (2s. 6d. in the pound) on the Roan Antelope and Nkana mines; and of 17½ percent (3s. 6d. in the pound) on the Nchanga mine, provided that the percentage reduction should not in any case reduce the wages of the men concerned to less than £2 16s. a shift, or £59 16s. for 26 shifts.

★ Transvaal gold production for September was declared by the Chamber of Mines at 984,174 oz., a decrease of 29,907 oz. compared with August. The total value, at £8,488,401, was £257,947 lower.

The number of natives employed on Witwatersrand gold mines in September was 292,246, against 295,788 in August.

★ The whole weight of the cost-of-living allowance granted to the European employees, retroactive to May 1, was included in the September returns, for the total amount of "back money" was disbursed to the men last month. In addition, the increased railway tariffs have had an adverse effect on working. Both these factors will continue to be reflected in future returns.

Over the past three months the profits of the seven groups comprising nearly all the mines declined sharply. In July these totaled £2,480,734. In August they had fallen to £2,222,350, and last month the relative figure had slipped down to £1,844,752. Tons milled totaled 4,936,800 in July, 4,775,100 tons in August, and 4,597,500 in September. Output of the mines is shrinking.

Technical improvements in operation have been made in the past few years, notably in blast-hole diamond drilling. Were the mines to switch over completely to diamond drilling, however, an enormous amount of equipment would have to be scrapped and the capital cost would be very heavy. This process, if it ever becomes general, will have to be gradual and will entail an almost revolutionary change in Rand mining practice. For many practical reasons this is probably out of the question at present.

The fact is that present conditions are making it more and more difficult for the industry to carry on. The burden of costs has brought a number of producing mines dangerously close to the point at which operations become uneconomic. A glance at the analysis of gold production and costs for January to August ought to make this clear. Out of the 45 producing mines on the Witwatersrand, 15 show a profit figure per ton of more than 10s. Of the remainder, 16 are in such a position that an increase in working costs of 1s. per ton of ore milled will either put them in the position of having to cease operations or will bring them close to an unprofitable working status.

★ The crisis facing gold mining caused by high costs was discussed by G. Carleton Jones, president of the Transvaal Chamber of Mines, at the special meeting held on Oct. 26. According to Mr. Jones, the fundamental problem that faced the Government and the country concerned one of two policies: that of keeping the cost structure down and so insuring the expansion, or at least the maintenance, of the country's economic activity; or, alternatively, that of allow-

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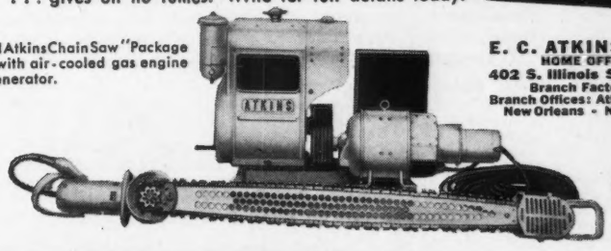

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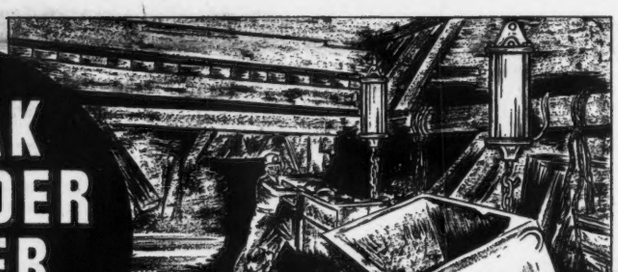

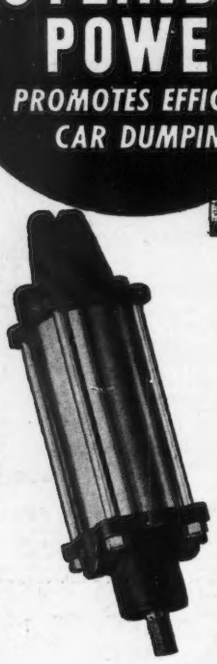

Illustration shows how NOPAK Air Cylinders may be used for fast, efficient dumping of mine cars. A single-acting cylinder is suspended from an overhead beam at each dumping station. A chain-hook, attached to the piston rod, is slipped under the dump body. A 3-way valve controls the upward cylinder stroke needed to dump the contents. When air pressure is released, dump body and piston rod return to original position by gravity.

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NOPAK

VALVES AND CYLINDERS

DESIGNED for AIR and HYDRAULIC SERVICE

Pachuca Survey

(*Continued from page* 81)

The company's mining engineering department made the survey under my immediate supervision, nine engineers being employed in all. D. L. Masson and Eduardo Villaseñor did most of the difficult underground work; and Jesús Becerril and C. Beckwith assisted with other work. In addition, J. L. Arredondo, J. J. Galindo, F. Ruelas, and E. Viramontes helped with the plumbings.

An old report of the company mentioned a connection in 1834, when Terreros shaft holed through, after being raised and sunk simultaneously in eight portions. The various stretches "formed as straight and perfect a shaft as if it had been driven only from the surface." One wonders whether mine surveying has advanced since then to the extent shown in other fields.

I am indebted to M. H. Kuryla, vice president of United States Smelting, Refining & Mining Co., and managing director of Compañía de Real del Monte y Pachuca, and to A. B. Marquand, director, of the latter company, for permission to publish this article.

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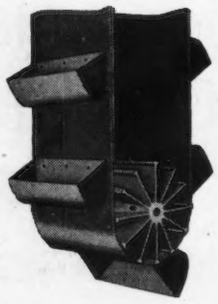

In handling any material on conveyors, almost always some of the material is carried between the face of the pulley and the pulley side of the belt. The wings of the Sprout-Waldron Belt Saver Pulley eliminate the grinding or crushing action common with conventional type pulleys, and the life of the belt is greatly extended.

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Manufacturing Engineers

MUNCY PENNSYLVANIA

Africa (*continued*)

ing the cost structure to continue to rise and so jeopardize the country's future. Striking illustrations were given by the president to show how working costs had so risen that the operations of a large part of the industry were on a slender margin of profit. The true rise in costs per ton since 1939 had been from 19s. 5d. to 25s. 10d., and per ounce, from 91s. 8d. to 126s. 6d. There had been an overall rise in the price of gold since 1939 of 15 percent, and a rise in the cost of producing gold of 38 percent. Over the last 6½ years the average annual increase in working costs had been 1s. per ton. Over the 18 months to the end of June, the rise had been 2s. per ton, and the upward trend was now even steeper. In 1935, of 33 producers none returned a profit as low as 3s. a ton. In 1940, only 2 out of 44 were in that category. Last year seven mines out of 46 were operating on or below that margin, and one had closed down. The position had deteriorated during the current year. In July 10 mines were operating on a profit margin of 3s. or less per ton, and Langlaagte had a loss of 4d. per ton. These 11 mines employ 9,300 Europeans and 71,000 natives—nearly one-quarter of the industry's labor.

The demand by the African Mine Workers' Union for a wage of 10s. a day for native mineworkers, if met, would have forced the closing of 35 of the existing 45 gold producers. In other words, three-quarters of the present mining operations would have ceased, and slightly more than four-fifths of the total native labor force would have had to look for work.

Supplies constitute about a third of the industry's total cost and have risen in price by about 33 percent above the immediate postwar level. The costs of capital equipment have risen by about 80 percent.

The president dismissed the suggestion that ore grade should be raised. To increase the grade of ore milled would, for technical reasons, lead to a vicious spiral of ascending costs. Likewise it was the opinion of the foremost engineers in the industry that only a limited amount of further mechanization was feasible.

Discussing briefly the price of gold, the president said that the practical problem was as much concerned with when the price might be raised as with whether it would be raised. He believed it would be injudicious for industrial leaders to base their decisions on an assumption that a general rise in the price of gold was imminent or probable.

With regard to the Orange Free State, he thought that working costs would probably be higher than in the older gold fields. Considerable faulting was expected, and the temperature gradient was steeper than on the Rand. The time factor was of great importance, and many years would elapse before the new field was

in production. The president considered that the Free State provided an opportunity for retarding the decline in gold production rather than creating new and heightened prosperity.

Pan-American Congress

(*Continued from page* 86)

site of Brazil's largest mica mine, completely mechanized and responsible for more than 10 percent of mica exports during the war. Arriving at Itabira, the visitors climbed Cauê Peak, an impressive mountain of massive low-phosphorus iron ore with reserves estimated at 500 million tons of hematite. Companhia Vale do Rio Doce, which owns the mine and exports the ore, has a modern crushing and sizing plant and good storage facilities. Production is expected to reach 1,500,000 tons a year when modification of the narrow-gage railroad is completed. The Monlevada plant of the Companhia Siderurgica Belgo Mineira was also visited. This is the largest integrated charcoal, pig-iron and steel plant of the world and has four 120-ton per day blast furnaces, four 40-ton basic open hearths, and rail and wire mills, besides two hydroelectric power plants. Production is 140,000 tons of steel a year, which is expected to increase somewhat after installation of an 800-ton per day sintering plant.

At Belo Horizonte several visits were made, including the famous Morro Velho mine, Brazil's oldest gold producer, which has been under continuous exploitation since 1823 by the St. John del Rey Gold Mining Co., an English concern. The complex ore is mined down to the 7,500-ft. level and carries about 7g. gold per metric ton. Production is 1,000 tons of ore a day. Inspections were also made of the Escola Nacional de Minas e Metalurgia and the aluminum reduction plant of Electroquimica, SA, near Ouro Preto. This plant, with a rated capacity of 2,500 tons of aluminum per year, has been idle recently as a result of financial difficulties. Bauxite is mined near by at the Cruzeiro mine.

Participants in Trip No. 2 were taken by rail to Lafaiete to see the manganese mine of Morro de Mina, under Companhia Meridional de Mineração, a subsidiary of United States Steel Corporation. The mine produces about 60 percent of Brazil's manganese, and during the war total exports were at a level of 500,000 tons a year. The Casa de Pedra iron-ore mine was seen before proceeding to Diamantina, center of the important Jequetinhonha River diamond district. Other points visited were the old diggings of Sao Joâo da Chapada and the Esperanca pig iron and steel plant of Usina Queiroz Junior.

Coal mining in Santa Catarina and Rio Grande do Sul was seen on Trip No. 3. The fourth trip took visitors by plane to Pocos de Caldas to see the large bauxite mines of Companhia Brasileira de Aluminio. Reserves here are on the order of 10,000,000 tons of high-grade, low-silicia ore which the company is to utilize for its aluminum reduction plant to be erected at Rodovalho, Sâo Paulo. The large zirconium ores mine of Serote, operated by Companhia Geral de Minas, was also visited at Cascata, near Pocos de Caldas. En route to Sâo Paulo the visitors stopped at the tungsten mine of Companhia Mineração Inhandjara, at Jundiaí, which is treating 100 tons of ore per day and shipping the wolframite concentrates to the United States. Some tin concentrates are also produced. At Sâo Paulo visits were organized to the Instituto de Pesquizas Tecnologicas, the University of Sâo Paulo, and the refractories plant of Ceramica Sâo Caetano. The final stop was made at Mogi das Cruzes to inspect the new 50,000 tons a year integrated steel plant of Companhia Mineraçâo Geral do Brasil, which has two 70-ton charcoal pig iron blast furnaces, three 20-ton basic open hearths, and a bar stock rolling mill.

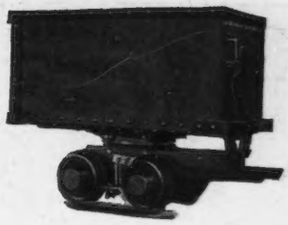
Resolutions Adopted

The Congress voted approval of recommendations that each section furnish Santiago headquarters with a list of its members and addresses from which a master list could be published each year; that each section furnish, for publication in the Quarterly, notes on new mining developments, legislation, and bibliography; that each section collect and file reports on mines and prospects requiring capital for development; that secretaries of sections exercise individual judgment in replying to requests for information on ownership of properties or reporting engineers; and that the secretaries of sections, if called upon, assist members of other sections in obtaining information or introductions.

Among the resolutions adopted were the following:

1. That the existing cooperation among the American republics in the field of research in geology, mining, and metallurgy be continued and increased through cooperative agreements providing for the exchange and training of technical personnel and through mutual exchange of information; to the end that the American republics may utilize for mutual advantage the technical and material resources of the hemisphere for raising the level of life of the American peoples.

2. That the American republics, in promoting and establishing agreements for cooperation and interchange in the geological, mining, and metallurgical research fields, take due account of and make effective provision for coordinating such agreements and programs with the purposes and programs of such specialized bodies as may be established in accordance with the provisions of the United Nations Charter.



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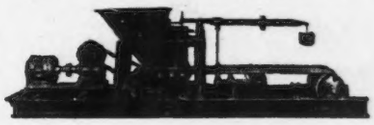

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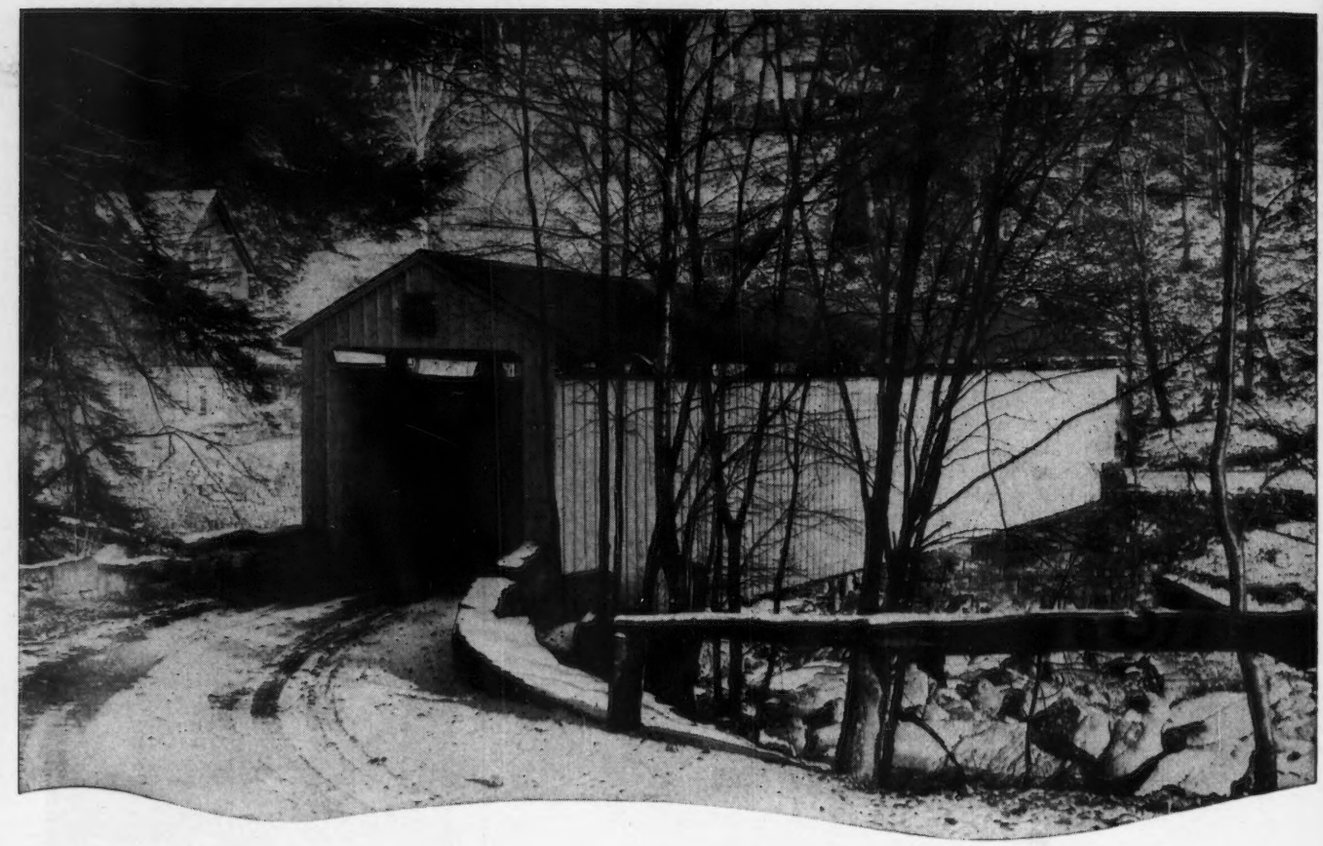

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INCENTIVES FURNISH THE DRIVE

THE COMING YEAR, 1946, and the years to follow can bring unprecedented prosperity to the people of the United States if the incentives to secure it are provided.

We have the advantage of starting with an economy which has demonstrated a capacity for expansion unequalled in any other country in the world. Our economy has demonstrated, also, one grave weakness—a recurring interruption of the upward trend of production and living standards by wasteful and paralyzing periods of recession. Recovery from each depression always has carried us to new heights of economic welfare, but the toll of the years of blight has been harmful to everyone.

The job ahead of us is a dual one. We must maintain the vitality of an economy which, over the years, has yielded an enormous increase in the American standard of living, and we also must improve its stability.

The Dynamics of American Production

In the last prewar year, 1940, the population of the United States was 3⅓ times as large as it was in 1870. But the national production, measured in dollars of constant purchasing power, was 10 times as large at the end of the period, and industrial output had increased 20-fold.

In the meantime, the average number of hours of factory workers had been reduced from about 63 per week in 1870 to less than 40 in 1940, while average hourly earnings had more than trebled in dollars of constant purchasing power. Thus "real" weekly or annual wages in manufacturing had doubled over the 70-year period, even though the work-week was cut by 35 per cent. This was made possible chiefly by a tremendous increase in the quantity and quality of the mechanical facilities which were provided in American manufacturing industry. Manufacturing capital investment per worker was multiplied by 6 times over the period in question. But the return per dollar invested, while it has fluctuated widely between good years and bad, showed no general upward trend over that portion of the period for which measurement is practicable.

Incentives in American Manufacturing

There has been, historically, a remarkably consistent pattern in the division of the realized income from the expanding manufacturing output of America. Reliable statistics are not available for as far back as 1870, but from 1899 through 1939 the average share of wages and salaries has been 82½ per cent against 17½ per cent as the share to investors (including dividends, interest, rents, royalties, and non-corporate profits). There have been, from year to year, relatively minor divergences from this pattern of distribution, but there is no discernible trend during the period away from the averages cited.

It is suggested that the persistence of the average 17½ per cent share of realized income from manufacturing that was maintained for the 40 years preceding World War II may represent the proportion that is needed to produce the dividends, interest, rents, royalties, and non-corporate return that will provide for the continuing investment upon which an expanding productivity such as we have had in the past depends. At any rate, it would seem reckless to depart too radically from such an established pattern at a time when unprecedentedly large private capital investment is counted on to make up for the drastic curtailment of such investment during the war years, and to carry us to the new high levels of civilian production set as our postwar goals.

The Distribution of Manufacturing Income in War

At the beginning of the war, the Government adopted controls and a tax program designed to prevent wartime activity from resulting in un-

duly swollen private returns. Due primarily to huge volumes, the profits *before* taxes of manufacturing industry were very high, but throughout the war its profits *after* taxes averaged returns no larger than they had been in good prewar years. Relative to volume, they were considerably lower than in prosperous years in the past. Again, there can be no complaint at results that generally were in accord with a national wartime policy.

But it is fair to note that the wages of manufacturing labor were allowed to increase substantially during the war. Between January 1, 1941 and April, 1945, average weekly earnings per worker increased by 77 per cent. This was, in considerable part, a result of increased working hours and a shift from low- to high-paid industries, but straight-time hourly earnings on the same jobs increased about 40 per cent against a cost-of-living rise of about 30 per cent.

The net result was to alter drastically the 40-year relationship of the 17½-82½ per cent division of Realized Income from Manufacturing. The share of wages and salaries increased to over 90 per cent, and the investment share shrunk to less than 10 per cent.

Its Postwar Distribution

This wartime shift in the proportion of distributive shares has an important bearing upon current wage controveries. With union demands for wage increases ranging up to 30 per cent, and the economists of the Office of War Mobilization and Reconversion asserting that an average increase of 24 per cent is feasible without raising prices, it is pertinent to inquire how such increases would affect the prewar ratios that governed realized income distribution in manufacturing.

Forecasting is always hazardous, but if we assume (1) that in 1946 we shall reach the $160 billion level of national output which the Government proponents of general wage increases expect, and (2) that there will be little increase in productivity because of the continuing process of reconversion, and (3) that the Government will succeed in carrying its announced purpose to maintain present price ceilings, it appears that a 24 per cent general wage increase would reduce the share going to capital from 17½ per cent to 11 per cent even allowing for its increased return resulting from the repeal of the excess profits tax. The prewar ratios would be about maintained if wages remained at present levels.

Conclusion

Since the maintenance of these prewar ratios was accompanied by an unparalleled rise in the "real wage" of American workers, there is a powerful prima facie case for not tinkering with them. It should be noted, however, that some economists think that the size of the investment share of manufacturing income tends to provide more capital than can be absorbed by a mature economy, and thus contributes to those breaks in the expansion of the economy which, as stated at the outset, have been its principal blight.

Regardless of what may ultimately prove to be the validity of this view, no one can responsibly contend that at this early but crucial stage in the reconversion process is the time to test it. Now, no one knows whether, or what dimension of, additional wage increases can be supported without forcing up prices or reducing profits to a point that will discourage vitally needed private capital investment.

We want high and increasing wages in American manufacturing. We need them to provide an active incentive to workers to support expanding productivity, as well as to continue the trend of rising living standards in America. Equally, we need a continuing profit incentive of sufficient attractiveness to call forth the new investment upon which expanding productivity depends.

We can never attain our dual objective if we push one of these aims so far and so fast that it defeats the other.

President, McGraw-Hill Publishing Co., Inc.

THE FAILURE OF "FACT-FINDING"

THE PRESIDENT has asked Congress to grant him authority to appoint fact-finding boards to deal with nationally important labor disputes. Most citizens would like to see some reasonable and objective solution of the industrial strife that now is disrupting reconversion. Unfortunately, the record of the "fact-finding" procedure indicates that any claim of impartiality for this process is a gross misrepresentation.

The Administration bill would authorize the President to appoint such boards in cases certified to him by the Secretary of Labor. Each board would report to the President "its findings of fact and such recommendations concerning the dispute as the board deems appropriate." Its facilities and staff would be provided by the Secretary of Labor. The bill provides for an interval of not more than 30 days known as a waiting or "cooling off" period during which it would be "unlawful" (though no penalties are specified) for anyone to promote or encourage work stoppages.

Because the Administration did not wait for Congressional action upon its proposal, but appointed a number of fact-finding bodies to deal with current emergency cases, we have been afforded at least a partial preview of how the procedure may be expected to work out if laws establishing it are passed.

If the reports handed down by the fact-finding panels in the General Motors and oil disputes may be regarded as representative, it can be stated conclusively that Government-appointed "fact-finding" boards will concern themselves to only a minor degree with the establishing of facts. A far greater share of their effort will be concerned with the speculative business of forecasting future output and production efficiency and appraising the "ability to pay" of the companies involved. But the predominant emphasis will be placed upon framing recommendations for settling the disputes in line with announced Government wage-price policy.

In short, the procedure essentially will be one of registering with the public a government opinion as to how far wages may be raised in the cases at issue without raising price ceilings. Both the General Motors and the Oil Panels stated, in quite explicit terms, that this was their conception of the job assigned them.

"Fact-Finding" in Auto and Oil Disputes

As the General Motors Panel phrased it: "This board subscribes to, and has been guided by, the national wage-price policy" — which it summarizes as calling for wage increases to maintain take-home pay at wartime levels, to the degree possible without inflationary price rises.

The Oil Panel was even more forthright in the statement of what it was supposed to do. "In the judgment of the panel," it declared, "the earnings of the workers must be as high as is consistent with both the maintenance of the stability of the price structure and the provision for reasonable returns to the owners of industry." In other words, prices and the return to investors are to remain fixed, with labor entitled to an ever-increasing return up to the limit of what the traffic will bear.

Having thus outlined their respective conceptions of the job, each panel proceeded to carry out its mission.

The Automobile Panel recommended that General Motors increase its basic hourly wage rates by 19½ cents, which amounts to about a 17½ per cent increase on the company's average hourly wage of $1.12. The Oil Panel recommended an 18 per cent increase in basic hourly wage rates, or an additional 21 cents to the average wage rate of $1.20.

The General Motors recommendation was based almost exclusively upon the Panel's calculation that a 19½ cent raise would keep weekly take-home pay equal to that earned in 1944 when the work-week averaged 45.6 hours. The calculation turned on an estimate of what the effective work-week was likely to be in 1946.

The Oil Panel's recommendation appears to have been based on a more complex but no more conclusive accounting. After calculating that the maintenance of July 1945 take-home pay after 40-hour shifts were restored would require a 22 per cent increase in straight-time hourly wages, it recommended that an 18 per cent increase be made. It accounted for 9½ per cent of this by noting that this was needed to cover cost-of-living rises, and explained that the rest was justified by a combination of factors including loss of premium overtime pay, higher productivity, and settlements already negotiated. Since the Panel gave no indication of the weight given to these several factors, it may not be unfair to assume that the last-named was given preponderant importance, since 18 per cent was the increase already granted in collective bargaining by Sinclair and certain other oil companies.

Higher Pay Without Higher Prices

Both panels stated that the pay increases recommended could be met without raising price ceilings, but neither documents its case on this score with very conclusive "facts".

The Oil Panel confined its observations on this account to the statements that only one company in its group had pleaded "inability to pay" and that the industry was in a generally profitable position during 1943 and 1944.

The Automotive Panel stated that, under a number of assumptions about the 1946 operations of General Motors which it believed to be valid, the Company would have higher earnings than it had in 1941, its previous record year. It specifically stated that its findings in the case were not applicable outside the

automobile industry, but it recognized that the General Motors settlement would more or less determine the settlements of other automotive companies. It stated that it had not been able to arrive at a clear conviction as to the ability of other auto makers to pay similar wage advances, but it dismissed the issue by observing that they could expect to operate at full capacity in 1946, and that this should provide savings to offset the increased wage expenditures.

From the management point of view, one of the most serious limitations in the panels' procedure was their failure to deal with any of the Company claims put forward. In ordinary collective bargaining the demands of both sides are advanced and concessions in one direction are traded for concessions in the other. Here, although the companies involved had insisted upon their need for guarantees against contract violations and wild-cat strikes, and for other union concessions, nothing but the wage issue was considered by the "fact-finding" bodies. The General Motors Panel specifically recommended that the wage increase of 19½ cents be granted, but that otherwise "the status quo prevailing before the strike be restored by the reinstatement of the 1945 contract between the parties." Handled thus, fact-finding becomes indeed a wholly one-sided exercise.

Both panels accepted, quite uncritically, the general position taken by Government spokesmen that wage increases are inflationary only if they are directly translated into price advances. It should be obvious that all wage increases add to the inflationary pressure, if made at a time like the present when consumer purchasing power far outstrips the volume of goods and services available to satisfy it.

"Fact-Finding" Dodged in Steel and Rails

It is ironic, too, that even while the Automotive and Oil Panel groups were holding the "government policy" line, the President and his Reconversion and Stabilization Directors were busily at work trying to dent it. In the steel dispute, although price rises in this industry have a particularly sharp inter-industry impact, hearings by the appointed fact-finding board were deferred while negotiations were carried forward by the President and his advisors under which the industry was offered a price increase of approximately $4.00 a ton on condition that U. S. Steel and the United Steelworkers agree upon a mutually acceptable wage boost. It is hard to avoid the cynical conclusion that wage increases constitute the major administration policy, and that the principle of not translating them into increased prices is sacred only in those cases where there can be some reasonably plausible showing that wages may be raised without price advances.

Much the same general conclusion — that the "facts" are controlling only if they support a substantial wage increase — is sustained by the history of the administration of the Railway Labor Act of 1926, often cited as a glowing example of how "fact-finding" by so-called Emergency Boards of Presidential appointees has served to prevent strikes on the railroads. It is true that reports of almost all of the 31 Emergency Boards appointed to look into threatened railway strikes in the 20 years since the act was passed have provided the basis for a settlement of the disputes in question. The fact — a real fact — remains, that in 1941 and again two years later the wage adjustments found appropriate by Emergency Boards in major railway labor disputes were revised upwards at the White House after the unions involved rejected them as unsatisfactory and threatened to strike. The second upward revision was made after government seizure of the railroads to prevent a national transportation tie-up. When the "facts" did not indicate a large enough wage increase to satisfy the union and the Administration, the "facts" went out the window.

It would be irresponsible to deny the importance of finding some tenable solution of current disputes that threaten to completely disrupt the reconversion process. But upon the evidence of experience, "fact-finding" boards cannot be expected to operate according to the common conception of their function — as agencies designed to sift out for the public an objective and significant weighing of the facts behind conflicting claims.

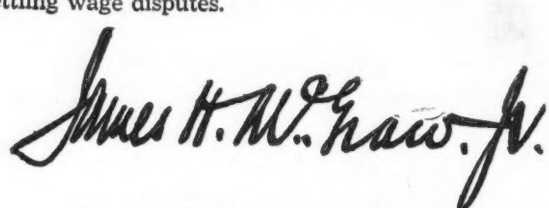
Without Principles Facts Mean Little

Facts, if they are assembled upon a sufficiently partisan basis, can be made to document almost any case one wishes to establish. The major difficulty in marshalling facts to resolve wage disputes is that there are no agreed-upon principles to determine the levels at which wages should be set. In the absence of such principles, it is inevitable that "fact-finding" boards, appointed by the Administration, manned largely by those who helped develop and administer Administration wage policies, and depending for technical assistance upon Administration Departments, will serve merely to implement Administration wage policy.

If Government means to reassert its wartime authority to fix wages — an objective specifically disavowed by the President and seemingly wanted by no one — it should accept the responsibility directly, rather than operate to that end through "fact-finding" boards which are independent in theory, but which cannot be so in fact.

The failure of the brand of "fact-finding" now urged upon Congress by the President is evident. Therefore, we must look for a solution along other lines.

What is needed is for labor and management to agree upon the principles that should govern the determination of wages under free collective bargaining. When such agreement is reached, then and only then, can fact-finding become an objective and useful instrument for settling wage disputes.



President, McGraw-Hill Publishing Co., Inc.

THE PRESIDENT'S WAGE-PRICE POLICY WON'T WORK

THE AMERICAN public had every right to expect that the long-awaited wage and price policy would break the impasse blocking the way to the swift and orderly reconversion of industry from war to peace.

The policy announced offers little promise of such solution, and this may well constitute a national calamity.

There is only one thoroughly constructive feature of the Presidential Statement of February 14 and its implementing Executive Order. It is the first Government pronouncement since the defeat of Japan to clearly define inflation as the major danger confronting us in the period immediately ahead.

That is a correct appraisal, and one long overdue. Up to now Government spokesmen, almost invariably, have sought to carry water on both shoulders. The Administration has justified its policy of promoting wage increases as a measure necessary to forestall deflation — to keep purchasing power from falling and forcing the economy into a violent tailspin. The strict holding-of-the-line on price ceilings has been defended as necessary to prevent runaway inflation. Unfortunately, while the President now exhorts all to enlist in a crusade against inflation with a voice that is clearly Jacob's, his program for dealing with it still employs the hairy hands of Esau to promote the very danger which he is urging everyone else to combat.

The "new" policy provides for a continuation of the wage increases that have been pressured through by Government mediators, "fact-finding" boards, and direct seizures until they have been made general throughout industry upon the dimension established in recent patterns. It offers industry the single concession of prompt hearings and decisions upon claims for price advances, but the yardsticks for judging such claims are exactly those which OPA has applied in the past. Since the past procedure has led us into our present difficulties, it is hard to see how it will serve now to lead us out of them.

Past Government Policy Fostered Dissension

At the war's end, it was obvious to everyone that what was needed was the swiftest possible reconversion of industry. It should have been equally apparent that we were faced with the difficult problem of controlling tremendous inflationary pressures which would be particularly insistent until peacetime production could be mobilized at high volume. This was made almost inevitable by the huge backlog of accumulated demand, for both capital and consumer goods, and by the unprecedented volume of liquid funds at the disposal of individuals of all classes. The only circumstance that could have modified the inflationary complexion of the postwar picture was the possibility of such wholesale and prolonged dislocation and unemployment in the process of readjustment that people would have been frightened into freezing onto their savings instead of spending them.

It soon was apparent that just the opposite was taking place. The early transition was extraordinarily swift, unemployment was lower than anyone had dared hope, and civilian spending outstripped all previous records. The circumstances called for strong anti-inflationary fiscal measures, along with a firm maintenance of price and wage controls alike.

Instead of adopting such a balanced program, the Government immediately discarded all wage controls, and in addition started an active campaign for promoting large wage increases. The President, upon a number of occasions stated flatly that American industry generally could and should grant substantial pay advances without any compensating price rises. His Office of War Mobilization and Reconversion estimated that average increases were practicable to the extent of 24 per cent. Given such Governmental encouragement, it was inevitable that labor leaders should do exactly what they did—file extravagant wage demands at the beginning of the reconversion process, when accurate appraisal of production schedules and costs were least susceptible of calculation, and when the shortage of civilian goods multiplied the inflationary effect of any increase in purchasing power.

At the same time, the OPA was fighting to hold the price line in a good cause, but with singularly inept procedure. It acted, seemingly, upon the premise that it was always better to give less price relief than was needed rather than enough, that relief provided under its formula was preferably to be granted later rather than on time, and that the interests of lower-bracket income receivers should be protected by a particularly tough resistance to raising prices of cheaper goods. The latter procedure seems to have boomeranged by virtually driving many of the lower-priced lines off the market.

The sum of these wage-price procedures resulted in work-stoppages of epidemic scope. Many business concerns faced with the prospect of immediately unprofitable operation, uncertain that new wage demands would not be made with Government support as soon as volume production was established, and without assurance as to when price controls would end, refused to assume inevitable losses even when confronted with combined union and Government pressure. The fight was on.

"New" Policy Differs Little From Old

With inflation now clearly recognized as the immediate danger, it might have been expected that the new wage policy would reverse the former practise of lending active encouragement to new wage advances. But that would have brought down upon the Administration the wrath of all organized workers who had not yet been granted increases already bargained through by other groups. This was avoided by directing the National Wage Stabilization Board in effect to approve any wage increases necessary to give general advances comparable to those already made. The only brake applied on the wage side lies in a directive to the Board not to approve, as a basis

for price relief, wage advances that go beyond the established pattern.

On the price side, the new directives to the OPA entail no important departure from its past procedures. Even the concession to review "hardship" cases promptly rather than after six months is only a pious hope, since it is unlikely that OPA is equipped to deal rapidly with the thousands of cases that will arise. A hardship case is defined as one in which, after absorbing an approved wage advance, an industry or establishment in a twelve months' period of normal-rate operation is judged by the Price Administrator likely to operate at a rate of profits to net worth less than it averaged in the base period of 1936-1939.

Let us see what this really means. In the first place, the rate of manufacturing profits in the base period was only moderate. But since the average net worth of manufacturing corporations has increased one-third over what it was in the base period, the application of the OPA formula, *assuming that its Administrator correctly appraises the twelve-month outlook,* seems to provide for absolute profits one-third higher than the 1936-1939 average.

The OPA formula, however, applies to profits *before taxes.* What really matters to stockholders is profits *after taxes.* Corporation taxes have been increased from an average of 17 per cent in the base period to 38 per cent now. This means that the price adjustments granted by OPA on average will yield profits *after taxes* no larger in dollar terms than in the 1936-1939 period, although 1946 manufacturing sales are expected to be more than twice as high. Under this procedure the *ratio* to net worth of profits *after taxes* will be one-fourth lower than the 1936-39 average. This clearly undermines the incentives upon which production at high level depends.

The workers get wage increases which promote inflation. The Government, bailed out from its previous mistakes, gets political credit for raising wages. And the entire bill is handed to American industry for payment.

But the Danger of Inflation is Real

Under these circumstances, there is a growing demand on the part of business groups that price controls be rescinded immediately. It is argued that, once the restrictive influence of price controls is relaxed, capacity production soon will supply sufficient goods to prevent undue price inflation.

It is understandable that business should wish to be rid of Government controls which have operated in such a thoroughly inconsistent and damaging fashion. Unfortunately, there is ground for believing that more harm might result from this cure than from the disease.

There is nothing in our situation that could bring on the kind of inflation that has been experienced by certain countries of Europe and Asia—in which the value of currency deteriorates until it takes a cartload to buy a pair of shoes. But our situation now is definitely more threatening than it was in 1919, after the first World War. At that time wholesale prices and the cost-of-living skyrocketed almost 25 per cent within twelve months. If we discard all controls now, as we did then, prices might easily go up from 25 to 50 per cent in a year's time.

An inflation of that dimension can do tremendous damage. While it lasts, all those dependent upon fixed incomes are damaged—all bondholders, including those who hold war bonds, all life insurance and annuity beneficiaries, all pensioners. Generally, the purchasing power of wages and salaries would shrink, with white collar and unorganized production workers hardest hit. Controlled-rate industries, such as railways and other utilities, would be squeezed. General business would suffer least of all—while the boom lasted.

But such soaring booms cannot last. The 1919 boom burst in mid-1920. By summer of 1921 industrial prices had fallen 40 per cent and industrial production was off 35 per cent; farm prices had fallen 50 per cent. This time the boom might soar higher and last longer, but that would merely result in an even more precipitous drop. Business would be hard hit along with everyone else, and high wage rates would mean nothing to the unemployed.

Controls Must be Consistent and Progressively Relaxed

But if the Nation cannot afford to risk disastrous inflation by immediately abolishing controls, neither can business afford to accept the program which the Administration now proposes.

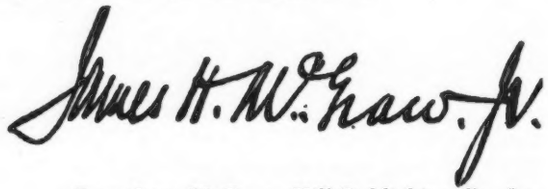
The wage-price policy will not hold the inflation line so long as the Administration is leading the assault to breach that line on the wage side, as it has done ever since VJ-Day.

The Administration is now going before Congress to ask for a broad extension of its wartime powers for an additional year beyond June, 1946.

Congress must see that this is not granted except upon terms that guarantee the use of such power with a consistency that has been conspicuously absent up to now.

1. It must provide sufficient price relief to yield profits normal to high-level operation.
2. The basis for price relief must be clearly defined and geared to actual costs of operation at the earliest possible date.
3. OPA administrative procedures must be speeded-up and streamlined, or the delays that characterized past administration will become intolerable.
4. It must see that, once established, the new line is held as long as wartime controls are continued by enforcing restrictions on wages as well as prices.
5. It must set an early date for the termination of all wartime controls and provide for progressive and bold steps for de-control to be taken before that date, as soon as production levels in any field are sufficiently high to restrain runaway prices.
6. It must proceed without delay to marshal fiscal and monetary policies to combat inflation, in order that price controls may be discarded at the earliest possible date.

Unless Congress does this—and it will not be easy in an election year—we are headed for an explosion. It will come in one of two forms—either in a continuance of industrial strife, or in a rocketing inflationary boom that can only end in collapse and depression.



President, McGraw-Hill Publishing Co., Inc.

LOAN TO BRITAIN

. . . Investment in World Economic Unity

CONGRESS should give swift and confident approval to the proposed loan to Great Britain.

Few other issues of foreign policy in the present troubled world lend themselves to such clear appraisal of where our National interest lies.

In simplest terms, the question is whether we should extend to Great Britain a credit of $3¾ billions (plus $650 millions in payment for lend-lease balances) in return for her promise to repay principal with interest over a fifty year period starting at the end of 1951, and her pledge to give the fullest possible support to the kind of world trading system which it is the declared policy of both the United States and the United Nations Organization to promote.

We Can Afford to Make It

The sum we hazard is not inconsiderable, but financial risks have meaning only when related to resources. The line of credit provided by the loan will amount, at most, to a claim on 2/5 of 1 per cent of our gross output for the five to six year period over which it may be used. The interest rate charged, while moderate, is higher than our Treasury is paying upon current borrowings. The risk entailed is well within our resources as a creditor. In the considered judgment of the American and British technical experts who thrashed through the intricate accounting for three painful months, the amount and terms offered will suffice to allow Britain, under rigid austerity, to relax her system of foreign trade restrictions, and to expand exports sufficiently to pay her debt commitments.

Against the considered risks of extending the loan, there must be weighed the certain costs of refusing it. Without the loan, Britain has no recourse but to maintain and extend the system of bloc trading which she adopted under stress of world depression and world war. If that is the route Britain follows, she will carry with her a large part of the sterling area countries — all British Commonwealth and Empire countries (except Newfoundland and Canada) plus Egypt, Iraq, and Iceland—and many of the nations with which the United Kingdom has payment agreements (Argentina, Bolivia, Brazil, Chile, Paraguay, Peru, Uruguay, Belgium, Czechoslovakia, Denmark, Finland, France, Netherlands, Norway, Portugal, Spain, Sweden, and Turkey).

Altogether, the United Kingdom's orbit accounts for more than half of the world's imports and exports combined. It likewise is crucial to the trade of the United States. In the years immediately preceding the war, the sterling area and payment-agreement countries provided just under one-half of both the import and export trade of this country.

Russia, of course, will continue to conduct her foreign commerce exclusively upon a state-trading basis. Before the war, the Soviet Union transacted only a little more than 1 per cent of foreign trade business, but its future sphere of influence will be large—conceivably embracing as much as 30 per cent of total international trade.

We Cannot Afford to Refuse It

If the weight of British influence in foreign trade is thrown toward the Russian pattern rather than toward ours, it is apparent that bloc trading, with all of is supporting devices—bilateral deals, exchange controls, import and export quotas, subsidies, currency manipulations and the like —will be the prevailing pattern for foreign transactions.

In self-protection, the United States would have no alternative but to conform to the dominant pattern. We should be forced to form our own bloc, and to enter into active economic warfare in bidding for trade concessions against the offers of our rivals. How well we would do this is problematical. To the game we would bring the largest economic potential in the world. But our handicaps would be equally impressive.

First, under a system in which political and economic motivations are inextricably fused, a democratic nation, and particularly one with a tradition of freedom in its domestic enterprise, would operate at a great disadvantage. We should inevitably be driven toward more and more government control of our entire economy.

Second, with a pattern of foreign trade in which our exports habitually are greater than our imports, our bargaining position in international trade is much weaker than our over-all economic strength would suggest. Under state-controlled trading we should still find it difficult to compete successfully without resort to loans, and under these conditions our loans would be supporting a system alien to our choice and interest.

Third, under a regimented system which made economic decisions subservient to political considerations, it is virtually certain that the volume of world trade would shrink. That was the clear experience of the nineteen-thirties. Thus, the

standard of living in the United States would suffer in common with all others, and we would be forced into a particularly drastic curtailment of certain war-expanded segments of our economy, at the very time when a large portion of the world is most in need of the products they can produce.

Weighing the Alternative Costs

In the years immediately ahead it is certain that from two-thirds to three-quarters of all international trade will be transacted either in pounds or dollars. If both circuits are linked in a determined effort to restore competitive world markets, to which buyers and sellers alike have access without discrimination, that will be the dominant system of foreign trade. If the sterling group with its satellites organizes a closed grid, our exclusive effort cannot preserve the trade pattern that we believe offers most to us and to the world.

No one can accurately measure the costs to the United States of refusing the loan and accepting the consequences. But unquestionably they would dwarf to insignificance the sum risked in the proposed credit. We would lose through the shrinkage of our trade, through the wrench of violent readjustments in our production patterns, and eventually through the curtailment of our over-all output below what it would be under an open rather than a closed system. We would lose heavily in economic liberty under a procedure that can be followed with success only by a close regimentation of production as well as trade.

Most of all, we would lose in prestige, through demonstrating that we are still unprepared to exercise a world leadership to which our giant stature as the possessor of almost half of the world's economic capacity entitles us. Once again we would be exhibiting to the world political feet of clay supporting an economic frame of heroic proportions.

It Is Far from a "Soft" Bargain

There has been some disposition in this country to regard the loan to Britain as a somewhat "soft" and generally unprecedented transaction that smacks of charity. This is the sheerest nonsense.

In the first place, the kind of economic system we want has never functioned and cannot operate now without a lender. For many decades prior to World War I Great Britain filled the creditor role. In 1913 her foreign investments totaled $19 billions, and she not only made such transactions pay, but they proved her salvation through two grim wars. Her credits helped in the industrial development of a large segment of the world, including the United States. Of all the nations in the world, only the United States can assume now the mantle which Britain no longer can support.

In the second place, the terms of our proposed loan to the United Kingdom are far from easy. Britain put a substantially greater proportion of her relatively meager resources into the war than we did, and dissipated a large share of her foreign holdings in the process while accumulating an outside debt of crushing magnitude. On a per capita basis her internal debt is greater than ours. Many Britons feel that our proposed loan is too small, and its terms too rigorous. If the amount proves to be inadequate, we shall have to consider supplemental aid at a later date. But the majority believe that the present offer gives a fighting chance to restore the system of world trade that we and they both want, and upon which the World Bank, the Monetary Fund, and the International Trade Organization under United Nations aegis are based. It is certain that without our loan all of this will go by the board.

In the third place, our proposed loan is far from being without precedent. Canada, which is linked by far closer economic ties to us than to the Empire, already has provided for a loan to Britain of $1,200,000,000. This amounts to almost a third of what we propose to lend, although Canada's population is less than 10 per cent, and her income is little more than 5 per cent of ours.

Shall the United States Lead or Follow?

The way to exercise leadership is to lead. Nothing could be more futile than to go half way toward establishing the economic order for which we stand, and then withhold the crucial measure that will make it work. Failure to approve the loan to Britain will be a clear default of leadership. Failure to approve it promptly will dissipate its effectiveness.

It has been officially stated that the British loan is a unique case that will establish no precedents for further credits to other nations. It is exceptional in its importance to our aim. But if the United States expects to make its economic program the dominant one for world trade, it must continue to exercise the creditor function without which that program cannot persist.

The most that we should ask is that future loan transactions be scrutinized as was this one to see that they offer comparable security and comparable return in support of the program for which we stand.

For the loan to Britain, it can be said that never before has one nation had an opportunity to gain so much at so little risk as has the United States in this uniquely decisive case.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 46TH OF A SERIES

HOUSING CAN COST TOO MUCH

EVERYONE in the United States wants our people, and particularly our war veterans, well housed quickly. Almost everyone, we believe, likes the vigor and imagination with which Wilson W. Wyatt, the housing expediter, is going about the job of mobilizing our housing resources.

No one, however, wants the veterans, or anyone else, to get a lot of severe economic headaches along with the housing. As it stands, the emergency housing program runs unnecessary risks of having such results.

Here are the reasons:

1. The principal opportunity the program offers to the veteran is that of buying a high-cost house where a chance to rent would, more often than not, meet his needs much better.

2. At the worst possible time, the program adds substantially to the dangers of a runaway inflation of the sort that inevitably ends in a crash.

3. Little is done to try to reduce the arbitrarily high costs of building, such as those resulting from restrictions imposed by labor unions and antiquated building codes.

4. By giving overriding priorities to unattainable goals of home construction, the program endangers a volume of industrial construction necessary to sustain full employment.

Needs of Veterans

First on the needs of the veterans. What many, if not most, veterans need is a chance to rent a place at a reasonable rental while they are getting shaken down in their postwar careers which in many cases are inevitably unsettled at this time. Essentially, what the "Veterans Emergency Housing Program" gives them is a chance to buy, for about $6,000, a house built along conventional lines and padded with much unnecessary labor and material cost.

But what are the alternatives? There are at least two. One is to put far more emphasis on more effective use of existing housing than the Wyatt program has thus far. The other is to see that the proportion of new rental units is much stepped up.

Incredible as it may seem, there are at present more than 2,000,000 vacant dwellings in the United States. Many of them should be demolished. But many permit of relatively satisfactory temporary use. Many more single dwellings can readily be converted into comfortable multiple dwellings. The emergency program assumes that only 350,000 dwelling units can be provided this year by these expedients, but it does not seem unreasonable to assume that this figure might be doubled by a vigorous drive. The result would be a better balanced emergency housing program, because it would provide more rental housing immediately and save critical building materials.

Of the new housing units contemplated by the Wyatt program, it is estimated that only about 20 per cent will be for rent. Before the war more than half of the homes in the United States were rented. That means that unless the Wyatt program is to create little less than a revolution in the terms on which homes are occupied, it must be revised to include a much higher proportion of rental units.

To secure the result in the face of present high building costs special inducements will be required. They might be provided by allowing accelerated tax amortization of, say, half the construction cost over the next five years, together with rent ceilings high enough to make this form of investment attractive. This would, of course, call for higher rents, but the actual price to the veteran, in woe as well as money, might well be much less in the long run than if he bought an over-priced house now.

Too Easy To Pay Too Much

One of the mysteries of the Wyatt program is its general emphasis on measures to increase the supply of money with which to buy houses when the demand for houses is already at an all-time high. Some veterans may need special financial help, but the plan to give 90-95 per cent mortgages generally on new homes is not only unnecessary but positively dangerous. By providing up to $3.5 billions of government-guaranteed credit for homes this year, and almost twice as much in 1947, the program will release an equivalent amount of individual savings to create further demand for goods and services. All that such generous mortgage terms will accomplish with certainty is a dangerous lengthening of the odds that we will not avoid a boom and bust cycle of inflation.

If building codes were brought up to date and arbitrary union working restrictions were eliminated, the way would be paved for reductions in the price of standard houses which, it has been estimated, might run as much as 20 per cent. This would both give the buyer of a new house a far better run for his money, and also reduce the inflationary pressure created by the super-generous credit arrangements involved.

Getting anything done along this line is difficult, particularly because the restrictions are imposed by tens of thousands of separate localities and organizations. Some headway is being made. The local emergency housing committees being set up under the Wyatt program provide a means of doing much more. Far more steam must be put behind this aspect of the program, however, if its greatest potentiality for permanently constructive accomplishment is to be realized.

Crippling Essential Industrial Production

The goals set for emergency housing construction —1,200,000 new homes started this year and 1,500,000 started in 1947—are higher than any qualified authority thinks can be met without crippling other essential construction. The reasons commonly assigned for such optimistic goals is that they are inspiring to those in the industry and soothing to those who want something tremendous done about housing.

Under normal circumstances, relatively little damage might be done by such excessive goals which are a common feature of most Washington programs trying to elbow their way to the center of the national stage. However, the emergency housing program carries with it top priorities for the materials to be used. Consequently, other essential construction will have to get along on whatever share of critical building materials will be left after all demands of home builders have been satisfied.

The Civilian Production Administration estimates that output of important materials will fall far short of needs. It forecasts a 15 per cent deficit in lumber, 18 per cent in bricks, and 52 per cent in cast iron radiators. Hence, unless building materials output can be stepped up far more rapidly than now seems possible, a prohibitive squeeze will be put on industrial building to provide the materials needed for the Wyatt program. This would complicate unbearably the problems of sustaining full employment and getting the flow of production so important in avoiding the boom and bust route.

Perspective on the Housing Shortage

What is needed is an aggressive drive to get full production of building materials as rapidly as possible. Such a drive should concentrate on measures aimed at helping the industry remove the obstacles to all-out production rather than on such measures as the subsidy plan which seems quite likely to succeed only in enmeshing the industry in more government controls. After making due allowance for the materials outlook and the needs for essential non-housing construction, housing goals should then be set as high as feasible. As matters stand, by setting construction goals before feasible material goals are determined, the cart is put before the horse.

There can be no doubt about the acuteness of the housing shortage and the necessity of a program commensurate with the magnitude of the problem. It also remains true, however, that the housing shortage for the nation as a whole is not quite as desperate as those who want the country to drop everything and go to building houses would have us believe.

During the war 3½ to 4 million new dwelling units were built or created by remodelling in other than farm areas. The number of families living in such areas increased by less than 3½ million. Even though some of this housing was located in remote places as an adjunct of war production works, the wartime increase permitted a margin for more housing per family at this time. Indeed, it has been estimated that the rate of doubling up is only about one-third as great as in 1940. The margin did not begin to suffice, however, to meet the needs of those millions of people particularly in the lower income groups who, thanks to rapid increases in income, can afford to have and insist upon having better housing than they have ever had before.

A rising standard of income which makes possible a new standard of housing for many people is a fine thing. Above all, it is important to see the veterans get the best possible break in housing.

But Housing Can Cost Too Much

The Wyatt program has many good features. The emphasis on prefabrication, though perhaps overoptimistic, is hopefully modern. The emphasis on local collaboration in solving housing problems which are inevitably in large part local should lead to permanently valuable results. The vigorous mobilizing of 300,000 temporary dwellings to meet at high speed some of the most desperate shortage is all to the good.

The main trouble with the program is that it does not pay enough attention to the economic havoc which may be created in the process of trying to meet its excessive goals. As a nation, we should be and are willing to pay a high price to get adequate housing. But the price will be too high if we:

1. Give the veteran a bad bargain by selling him an over-priced house.
2. Cripple industrial production needed to create good jobs for veterans, and
3. Touch off a disastrous inflationary sequence in the process.

These pitfalls can be avoided. All of us, including the veterans, have a common interest in seeing that they are avoided.

President, McGraw-Hill Publishing Co., Inc.

Congress has acted—and along these lines—since this editorial was written. If the President signs the legislation, we have taken one step forward. If he vetoes it, the voters must resolve a conflict between two branches of their government.

THE LABOR CRISIS
—*it's up to Congress*

IT HAS remained for John L. Lewis to demonstrate conclusively that, under the sponsorship of the federal government, the power of organized labor has been built up to a point where it can be used to paralyze the economic life of the nation. Therefore, in the elemental interest of self-preservation, the first order of the day is to cut down the power of organized labor to a point where irresponsible leaders no longer have the power to use it to cut down the country.

This will prove an exceedingly complicated job. The federal government, over a dozen years, has developed and buttressed the power of organized labor by many separate steps. They are interlaced in a pattern which cannot easily be unravelled.

Cutting down the power of organized labor to proper proportions will be an operation almost as delicate as brain surgery. To be successful it must impair no basic American political or economic right. It must leave intact the right of workers to organize and bargain collectively through representatives of their own choosing. It must leave intact the right to strike. But it must disassociate from the exercise of these rights opportunities for devastating abuse of the public welfare such as those demonstrated by Mr. Lewis. A meat axe is not the instrument for this operation.

Because of the complexity and delicacy of the operation to be performed it would be helpful if it could be carried out in a tranquil atmosphere. The urgency of the problem is such, however, that no time can be lost in getting at it.

Guiding Principles

However, the dangers that haste or heat will lead to serious blunders can be largely eliminated if the process of bringing the power of organized labor back within safe and reasonable bounds is governed by principles to which all fair minded people can fully subscribe.

The most important of these principles is that it is an abuse of public authority to extend special privileges to organized labor.

When in 1935 Congress passed the Wagner Labor Relations Act, one of the great buttresses of the power of organized labor, it was upon the explicit theory that organized labor was weak and needed coddling by the federal government if it were to survive, let alone grow big and strong. In the policy section of that act it was stated that "the inequality of bargaining power between employees who do not possess full freedom of association or actual liberty of contract, and employers who are organized in the corporate or other forms of ownership association substantially burdens and affects the flow of commerce . . . "

Regardless of whether or not that was a correct reflection of the situation in 1935, it bears no relation to the situation today. Under the continuous sponsorship of the federal government, the power and bulk of organized labor has waxed until today it is preposterous to regard it as the weak sister in its bargaining with employers. If, after being continuously demonstrated since V-J Day, the proposition that the pendulum of organized power has swung too far over on the side of organized labor needed any final and clinching demonstration, John L. Lewis provided it.

Changes in the Law

Translation of the principle that organized labor is no longer a weakling, requiring a diet of special privileges, into specific legislative enactments is a detailed technical operation beyond the scope of this statement. It is possible, however, to indicate some of the general lines it should follow. Here they are:

1. The duty to bargain collectively, now imposed upon employers by the Wagner Act, should also be imposed upon the leaders of organized labor who are now under no legal compulsion to bargain.

   For well over a month Mr. Lewis made a complete mockery of the process of collective bargaining by refusing even to state his demands until the coal operators had approved "in principle" a plan for a miners' "health and welfare" fund which he fancied. In the meantime the country was plunged into an ever deepening crisis.

2. Unions, as well as employers, should be made liable to suit for damages for breaking their collective bargaining agreements.

   A degree of responsibility commensurate with their age and power requires that unions be liable, to the extent of union funds but not the funds of individual members, for carrying out their agreements. To have it otherwise is to hold that a collective bargaining agreement is, by defi-

nition, a phoney agreement so far as the union is concerned. Outlaw strikes are the fruit of this lop-sided arrangement.

3. Employers should be given more discretion, in reinstating employees who have gone on strike than is now permitted by the Wagner Act.

The Wagner Act largely eliminates the risks involved in striking because of the requirements it imposes upon employers to take workers back when they have decided to return to work. These requirements make it virtually impossible for the employer to replace workers even if they are engaged in the most unjustifiable of strikes. At the least workers who have smashed up property and stirred up violence in the course of a strike should have no rights under the Wagner Act. How much further the Wagner Act strait-jacket should be loosened at this point should be carefully explored, and excesses encouraged by the Act should be removed.

4. The wedge which the National Labor Relations Board has driven into the orderly conduct of American industry by holding that foremen are covered by the Wagner Act should be eliminated.

The issue involved here is continuously mislabelled and confused as that of the right of foremen to organize. There is no question of the right of foremen to organize any kind of a legal organization they desire. That is their right as American citizens. The issue is whether or not the special privileges accorded by the Wagner Act, which in some circumstances has been so construed as even to prevent employers from talking with their workers, should be extended to foremen who, if American industry is to have a chance to do its duty effectively, must represent management with full loyalty and responsibility.

A member of John L. Lewis' United Mine Workers takes an oath which provides, in part, "that I will not reveal to any employer or boss the name of anyone a member of our union" and will "defend on all occasions and to the extent of my ability the members of our organization." Mr. Lewis insists that the coal operators contract to deal with foremen to be organized in a union where they will take that oath, and where their activities will be separated from the influence of employers by the barriers imposed by the Wagner Act. Such an arrangement undercuts orderly management of American industry.

5. The exemption of labor unions from the federal anti-trust laws, provided when organized labor was presumed to be weak, should be modified to take account of its vastly increased strength, and the use of this strength to destroy business enterprise and create monopoly.

As matters stand unions can run employers completely out of business by secondary boycotts and run fellow workers out of jobs in the process. An Ohio manufacturer, working with a government-certified C. I. O. union, is put out of business because A. F. of L. workers refuse to handle his products. Still the government, this time in the person of the United States Supreme Court, says that actions of this sort are above the law because Congress exempted unions from the federal anti-trust laws.

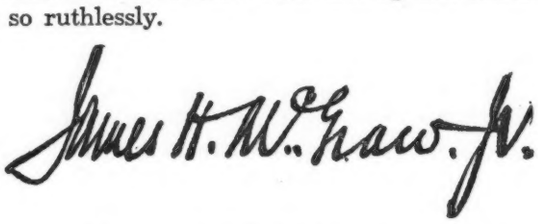
To eliminate one of the most devastating forms of restraint of trade, this exemption should be cut down forthwith by subjecting unions imposing secondary boycotts to the same penalties under the federal anti-trust laws as those to which employers doing the same thing are subjected. And the question of further narrowing the obsolete exemption of unions from the federal anti-trust laws should be fully explored.

6. The levying of special sales taxes for the exclusive benefit of unions should be prohibited by law.

As a matter of good government the right to levy consumption taxes should be reserved to the public authorities and used strictly for public purposes. As a matter of good economics, payments to workers or their organizations should be included in the payroll where they can be properly counted as part of the cost of production.

Equality Before the Law

When everything that can conceivably be accomplished by legislation has been accomplished there is no reason to believe that an ideal or even a surely workable system of industrial relations will have been devised. Many of the mainsprings of such a system lie deep in the hearts of men and far beyond the reach of legislation. There is no chance, however, of having such a system, or even a defensible system of democratic government until special privileges which tip the scales of power far on the side of organized labor are withdrawn and there is some measure of equality for employers and organized labor before the law. Though it is hard to believe it at the moment the country may come to be grateful to John L. Lewis for driving that lesson home so ruthlessly.



President, McGraw-Hill Publishing Company, Inc.

OPA IS DYING—
...*what next?*

IT IS NOW clear that direct price control of the OPA type is on the way out, if not by legislative limitation then by administrative collapse.

It is equally clear that we are by no means past the danger of a swirling upsurge of prices.

Then does it follow that the passing of OPA need be tantamount to a decision to let 'em rip?

It does not.

While the OPA machinery is grinding to a stop, we can bring into play more fundamental measures to keep prices within safe limits—and to allow private management a wider area of freedom. What this article proposes is a framework of control within which private business judgment can operate. Therefore, this preamble speaks directly to our friends in the business community.

Now is a time for unrelenting self-restraint by business management. As price control disintegrates, business must scrupulously hold to prices which, after covering costs, yield *normal* profit margins. Business has everything to lose and nothing to gain if its price policies emulate the excessive wage demands made by some unions.

True leaders of business sense the danger. They do not want to price themselves out of their markets. They do not want the tag of price hogs. They do not want a buyers' strike. All management must practice the self-restraint which characterizes the wisest leaders among us.

What Wasn't Done

Virtually all responsible economic analysts agree that if direct price control is eliminated and nothing else is done, prices will move upward. The only serious disagreements are: How far? And for how long?

Some careful and competent forecasters believe that, if all price control is lifted, the official cost of living index will shoot up at least 25 per cent within a year. Some of them think that wage rates will chase right after prices, forcing new price increases until the whole operation ends in a dizzy crash.

Others agree that prices will go up all right, but they think that increased production, made possible by disentanglement from OPA red tape, will bring them down again fairly soon.

Recent developments seem to support those forecasters who think that wage increases would chase right after price increases and thus keep "the inflationary spiral" spinning toward a ghastly fall. Unions already agitate for a new round of wage increases to offset price increases which have occurred in the few months since the last round of wage increases.

Therefore, the prudent course would have been to clean up the OPA price control system, to keep it in place for a limited period as a stop-gap, and, meanwhile, to arrange to replace it with more fundamental controls, PROVIDED the federal government itself stopped promoting excessive wage increases. *The greatest single contribution to the wrecking of the OPA has been the holes driven in price ceilings by government-promoted wage increases.*

But now the stop-gap is being eliminated, and the fundamental controls are not in place. Their erection becomes urgent.

The Basic Task Now

The danger that prices and wages will get to chasing each other around a ruinous spiral arises, of course, from the accumulation during the war of an enormous sum of money that could not be spent because about 40 per cent of the nation's production was being devoted to war. Men were paid wages and profits for making artillery shells. The shells were exploded. The money remains. It has piled up until the people's backlog of cash spending power, in one form or another, exceeds $225 billions—three times the total in 1939.

More than that, banks hold $115 billions of government securities—a sixfold increase since 1939. These securities can serve as the basis for an expansion of bank credit of many times their volume. A dollar of bank credit will, of course, buy as much as a dollar of cash.

The first and basic task of preventing runaway prices is: *Get this huge accumulation of purchasing power, actual and potential, under some kind of effective control.*

A second task is to see that no unnecessary additions are made to the flood of purchasing power overhanging the market. A third task is to get the productive machinery of the country running at top speed so that it can take up the accumulation in an orderly way, not in a boom-bust sequence. We shall talk here only about the first two of these tasks.

Are there ways of getting at the root cause of a disastrous wage-price spiral which are being neglected? There are many of them. Attention has been distracted from them by building up the battle over OPA as the Armageddon of price stabilization. It is important. But it is not Armageddon. If everything that Mr. Bowles and his associates want done by way of price control legislation were done, the problem of price stabilization would still remain unsolved in the continued absence of a program to deal effectively with root causes.

Basic Remedies

Here is a rough outline of the key elements of a basic program.

1. Cut public expenditures to the bone and let tax revenues accumulate as business volume increases—perhaps broadening the tax base at the same time.

Now, if ever, is the time to run a surplus and to use it to retire debt. Immediate upward pressure on prices would thus be removed and the burden of carrying debt when the going gets tougher later on would be relieved. A $10 billion surplus of federal, state and local revenues during the next year might not be too much.

An increase in social security taxes, as the House Ways and Means Committee proposes, offers one of a number of good ways to increase revenues. Deferring public works not immediately needed affords one of numerous ways by which substantial cuts in expenditures can be made.

2. Tighten the terms on which installment credit is available for the purchase of houses, automobiles, and other consumers' goods.

Allowed to run a free course, expansion of credit to buy houses and durable consumers' goods might easily add $15 billion to consumer purchasing power next year. No such injection of credit is needed now. The more a man buys "on time" the more cash he keeps to spend on something else. For most products the cash market alone is more than big enough to keep producers busy and customers healthy.

3. Restore to the Federal Reserve system its lost control over the supply of credit by limiting the opportunities for credit expansion now afforded by huge bank holdings of government securities.

The specific measures needed are highly technical, but are agreed upon by banking experts as both feasible and fair. The important thing for the public at large to do is to recognize that we are, in effect, sitting on a powder keg with lighted match in hand until the measures are taken.

4. Revive a vigorous campaign to sell government savings bonds and other government securities to the public.

Sale of government savings bonds cuts down current consumer spending. It also allows the Treasury, if government spending is held down, to retire government bonds which the banks hold. Thus, it simplifies the problem of keeping bank credit within safe bounds.

5. Prevent a speculative inventory boom of the sort which preceded the post-World War I business collapse in 1920-21.

This involves a continuation of the loose controls of inventories now exercised by the government. In more important degree it involves well informed cooperation by bankers and business men to keep inventories from being expanded unnecessarily.

6. Maintain controls on exports in order to keep within reasonable limits the impact on our market of huge foreign demand.

Emergency foreign relief requirements must be met. But foreign demand which is enormous apart from relief requirements must be kept under control until the danger of having it send prices of export products soaring is past.

Breathing Space for Business

This program would deal with causes, not symptoms. Hence, if promptly and efficiently installed, it would do a far better job of keeping the general level of prices and wages within tolerable limits than the OPA type of price control ever could have done—even if OPA had not been so often and so badly mismanaged. The program would also do this without tying up American business in a myriad of irritating and discouraging individual regulations. It would establish broad bounds within which business enterprise would be free to be itself, not a branch of bureaucratic enterprise.

The program proposed here also has the major virtue of flexibility. If prices start to reverse their present upward course within another year, the major parts of the program can be adjusted or removed quickly.

It would be gratifying to suggest junking at once all arrangements designed to place limits on price movements, even broad limits of the sort here suggested. But to do nothing while OPA falls apart, would be to run the grave risk of a runaway of prices and wages which, in the inevitable collapse, would do irretrievable damage to the business community and to the whole nation.

The risk is not worth taking.

President, McGraw-Hill Publishing Company, Inc.

LABOR DAY • 1946

—Time for wise union leadership

LABOR DAY, 1946, finds one hopeful element in the relations between American management and labor which was not there on Labor Day, 1945. It comes in recent expressions by a number of national leaders of organized labor that increased "real" wages depend upon *increased productivity*, i.e. increased output per man-hour. Increased money wages which are promptly offset by higher prices do nobody any good.

If these expressions, *which still remain to be substantiated by practical performance*, come to be accepted by the rank and file of labor in each community, Labor Day, 1946, can usher in a period of great and perhaps unprecedented improvement in the economic wellbeing of wage earners—as well as the wellbeing of the country at large. If, on the contrary, they remain merely window dressing and there is a continuation of the post V-J Day process of increasing wages and then prices, the outcome can only be the bursting of an inflationary bubble, with attendant suffering for workers and the community generally.

Competition requires management to bear down heavily on increased labor productivity as a prelude to wage increases. Management, however, has rarely made a more forthright statement on the importance of increasing labor productivity than that contained in a recent issue of LABOR'S MONTHLY SURVEY, an official publication of the American Federation of Labor.

SPOT CHECK ON LABOR OUTPUT

In the absence of reliable general statistics on what has happened to productivity of labor since V-J Day (because of strikes and reconversion complications) the McGraw-Hill Publishing Company asked the executives of a cross section of American industry to report their own impressions. The questions asked and summaries of the replies, which varied markedly from industry to industry and plant to plant, follow.

Question No. 1. How well have workers performed since V-J Day as compared to their pre-war effort?

Answer. Worker effort has been below pre-war. There are exceptions, particularly among older and more experienced workers; and there are quite a few signs of improvement.

Question No. 2. How much headway have you been able to make since V-J Day in improving labor productivity by better equipment and organization?

Answer. Some headway is generally being made, but it has been greatly retarded by inability to get new equipment and, in some cases, by lack of labor cooperation in improvements in organization.

Question No. 3. How much improvement in equipment and organization is to be anticipated in your business over the next year?

Answer. Marked improvement in productivity (in a few cases as much as 20 per cent) can generally be made if there is sustained production and full cooperation between labor and management.

William Green, the Federation president, led off with a "message to American workers." He remarked, "Our major need is increased volume of production." Observing that "wage increases this spring have been paid for by raising prices," the survey itself goes on to say that "Today America's ability to raise wages without increasing prices and living costs depends on increasing productivity in civilian industries . . . Here is the challenge to free labor and free enterprise today: *Cooperate to increase productivity and raise living standards without strikes.*" (Italics supplied.)

The importance of increasing production was also recently stressed by Walter Reuther, President of the United Automobile Workers, C.I.O., who remarked that his union "is just as eager as management to get the (automobile) industry into maximum production." In taking this general line he was in accord with the position of Philip Murray, head of the C.I.O., who in a book, "Organized Labor and Production" written with Morris L. Cooke, remarks that, "The modern labor leader also realizes that to receive a good day's pay a man must do a good day's work and that *increased productivity has been the vital factor in the country's industrial supremacy and its relatively high wage scale.*" (Italics supplied.)

In citing increased productivity as the key to increased "real" wages these labor leaders—and management—have the historical record entirely on

their side. In the 40 years prior to the outbreak of World War II output per man-hour for the country as a whole was approximately doubled. Over the same period the "real" hourly earnings of industrial workers were also approximately doubled. There were, of course, great variations in the increase of output per man-hour from one line of activity to another. Also, there were periods when increases in "real" wage rates lagged behind increases in productivity. But for the 40 year period as a whole and the economy as a whole there is no mistaking the fact that the route to increased "real" wage rates was increased productivity.

Three economic factors played major roles in this doubling of production per man-hour which has made America the industrial marvel of the modern world. One was the skill and diligence of American workers. A second was the skill and diligence of American management in organizing production. A third was the improvement of machinery and the increased application of power to it.

Wartime Record

During World War II this sustained increase in the productivity of labor in *civilian* manufacturing industries, which had averaged about 3 per cent a year, was brought to an abrupt halt. Much of the most efficient segment of the nation's labor force went to war or war industry. Also, civilian industry was starved for new equipment while we equipped our arsenals. The result was that the productivity of labor in those civilian manufacturing industries for which the government keeps records actually declined throughout most of the war. By 1945 it was no higher than in 1941, whereas, if it had maintained the long run average, it would have been about 12 per cent higher. In the meantime, however, average hourly wages in these civilian industries had increased about 40 per cent.

In *war* industry, which started from low levels of production at strange tasks, there were substantial increases in output per man-hour. Many of these increases involved new processes, improved techniques, and better machines which can be adapted over a period of time to the improvement of productivity of labor in civilian industry.

Since V-J Day, however, labor, led on by a misguided government, has had its sights on higher money wages instead of improving productivity which would have laid the foundation for increased "real" wages. Consequently, debilitating industrial strife ended in a round of wage increases which, in the absence of increased productivity, is being washed out by higher prices.

To Keep Production Rolling

However, as indicated by the summary of a McGraw-Hill sampling of the current experience of industry in increasing output per man-hour, which appears in the center of the page, there is hope that the situation ahead can be improved. After agonizing delays because of work stoppages, material shortages, and reconversion complications, industrial production is beginning to roll again. Allowed to roll it will not be long before it will be making those advances in productivity which are the only true basis for increased "real" wages.

If the process of keeping American industry rolling to new highs of productivity is to be resumed, management must see that the past practice of translating increased output per man-hour into increased "real" wages is not only sustained but wherever possible accelerated. For its part organized labor must abandon its manifold feather bedding rules and other production-restricting practices which afflict considerable segments of American industry. Further it must give incentive systems of pay, honestly conceived and honestly administered, a fair break. *Management and labor and government and the community at large must collaborate in removing that specter of working one's self out of a job which has been one of the greatest causes of restriction of output.*

The current emphasis by leaders of organized labor on the economic truth that increased output per man-hour is the only road to increased "real" wages is important. The next step is to see that recognition of this truth seeps into the rank and file of labor and industry and becomes the basis of a program of action at the local level. If it does, and quickly, Labor Day, 1946, may mark a tremendous turning point toward sustained prosperity not only for labor but the community at large. If it does not, union leadership will fail in its responsibility and must answer to the American people for the consequences of such a failure.

President McGraw-Hill Publishing Company, Inc.

A FREE ECONOMY IS WORTH FIGHTING FOR

BUSINESS must take the initiative if the price decontrol machinery, set up by Congress, is to be effective. The present price control law is far more than a set of instructions to the administrators of OPA; it is a challenge to business to be aggressive in speeding decontrol decisions and in persuading the Price Decontrol Board to adopt a strong stand for return to a free economy.

Thus far business has not met this challenge. *Two months after the passage of the new price law not a single application for decontrol of a major product had been filed by an industry advisory committee.* This is due in part to the red tape controlling such applications. Nonetheless, a continuation of such inactivity on the part of business can well result in perpetuating price control far beyond the time either the present law or sensible economic policy require.

It was the clear intent of Congress to hasten our return to a free economy. In the legislation continuing the general control of prices, Congress formally declared its purpose to have it "terminated as rapidly as possible."

To accomplish this, the House originally approved a formula which would have made decontrol mandatory when production had attained a prescribed level. The automatic decontrol provision was dropped before the bill was finally passed, partly because of the uncertain effects of strikes on production. But Congress did not mean to return the timing and extent of decontrol to the administrative discretion of OPA.

On the contrary, to assure having price control "terminated as rapidly as possible," Congress created a Price Decontrol Board and gave it power to overrule OPA when the board finds price control should be removed. Moreover, it gave to industry the right and the responsibility to seek decontrol. Also, in a further effort to speed up the decontrol process, it placed narrow limits on the time allowed for board decisions.

Congress had compelling economic reasons for doing its legislative best to speed up decontrol.

1. It is by all odds the best way to eliminate the bottlenecks in production and the black markets which have plagued the country since V-J Day.

   Rigid price ceilings promote shortages of badly needed commodities by discouraging their production. Such shortages both upset the flow of production and promote black markets. At present a considerable part of American industry is stymied by shortage of critical parts and materials. Price control is much to blame.

2. There must be flexibility of prices if a round of new wage adjustments, which may be forced on industry early in 1947, is to be negotiated without grave risks of seriously curtailing production.

   When, under the leadership of the national administration, the first post V-J Day round of wage adjustments was made, price ceilings were held rigid while wages were boosted. The result was a series of price-wage squeezes which upset production. They would have been disastrous if we had not been in a sellers' market, created by a tremendous accumulation of wartime shortages. In 1947, however, many industries will be in a buyers' market. It must be possible, therefore, to have wage increases reflected promptly in price adjustments if we are to avoid a repetition of the costly post V-J Day round of strikes, which often had price control as the key issue.

3. Rapid decontrol is necessary to maintain a high level of employment and production.

   Almost five years of price control inevitably twisted the factors of production and distribution far out of the equilibrium which would prevail in a free economy to which it is the clear purpose of the nation to return. Unless the return to a free economy is facilitated by a speedy and orderly decontrol, the jolt of an abrupt return to competition can be expected to upset employment and production seriously.

It's Up To Business

To encourage speed and boldness in decontrol, Congress provided for the reimposition of control over any prices which, after being released, might

get out of hand. The dangers of this sort are chronically exaggerated. During the 25-day period in July when there was no price control the Civilian Production Administration found that "manufacturers of finished industrial and consumer products have generally exhibited commendable restraint in increasing prices no more than increased costs."

All of this endeavor to speed up decontrol and expand its scope is likely to be futile, however, unless business furnishes the driving power for the machinery Congress provided. OPA certainly will not do it. Neither can the Decontrol Board be expected to go out and drum up cases.

The necessity for vigorous action by business in pressing for decontrol is increased by the fact that the general legislative standards to guide decisions by the Decontrol Board are vague. They must be clarified and sharpened by decisions in specific cases.

The main principle to guide the decontrol of non-agricultural products is that price ceilings shall be removed when supply is in approximate balance with demand. But what precisely does that mean? The meaning will become clear only through Decontrol Board decisions.

The same is true of the principle which makes automatic decontrol of a non-agricultural commodity contingent on whether or not it "is important to business costs or living costs." Business must press cases which will give specific meaning to those vague terms if decontrol is to get on apace.

Cards Are Stacked

At present the government has the cards pretty well stacked against rapid decontrol.

First, the key members of the staff of the Price Decontrol Board are holdovers from the Bowles regime which emphasized the importance of carrying on price control rather than speed in getting rid of it.

Second, in exercising his authority to prescribe regulations to govern petitions for decontrol, the OPA administrator has required excessively complicated statistical and economic data. Manufacturers who are sure they can convince any fair-minded board of the desirability of decontrolling certain of their products assert that they are blocked by statistical entanglements.

Third, OPA has discouraged business from moving immediately under one section of the law to speed decontrol. This section provides that products "not important in relation to business or living costs" may be freed from price ceilings immediately and must be freed by December 31, 1946, unles OPA specifically finds they are important to these costs. Instead of making it possible for business to move under this section now, OPA has issued rules which have the effect of blocking such a course until the end of the year.

In the light of obstacles such as these, it is not surprising that the record of decontrol to date is not impressive.

Decontrol Record

Since June 30 there has been a drop from about 70% to about 60% in the total value of products under price control. But most of the drop has been accounted for by food products, which Congress took the lead in decontrolling, and by industrial machinery which was being decontrolled when Congress acted. By far the larger part of manufactured consumer goods remains under control.

This, however, is no time for business to be discouraged. Rather, business should accept the obstacles put in its way as a challenge and work harder than ever for speedy decontrol.

The case for decontrol should not be stated in narrow technical terms. It should be based on grounds of broad public policy, and should demonstrate how a speedy return to a free economy can hasten the full release of the nation's productive power.

For example, there should be very clear demonstrations of how, in far too many cases, rigid price ceilings—(1) discourage production of key parts and materials by making such production relatively unprofitable, (2) create shortages of key parts and materials which tie up broad ranges of production or result in piling up lopsided inventories of partially completed goods, and (3) thus cut away the foundations of a stable economy and the prospects of steadily sustained employment.

There should be equally full demonstrations of the well known sequence from shortages to unrealistic price ceilings to black markets. Meat prices are rolled back, but the meat is rolled under the counter.

A free economy is worth fighting for. Liberty is preserved only by the constant struggle of those who believe in it. Neither the interests of the nation in a strong and well-balanced economy nor the interests of business itself will be served by drifting at this time. Now is the time for business to lead a strong offensive for speedy elimination of price control.

President McGraw-Hill Publishing Company, Inc.

THE LABOR CRISIS

..."Absolute power corrupts absolutely"

THE NEW CONGRESS is going to overhaul the federal laws governing organized labor. If the election returns left any doubt about that, John L. Lewis has removed it by torturing the nation with its second soft coal strike in six months.

If, however, the overhauling is to get at the roots of our labor troubles, it must go further and deeper than most of the proposals would go. Indeed, it must not stop until it has dealt decisively with that most basic cause of devastating trouble – the entrenched monopolistic power of enormous international unions, now concentrated in a handful of union leaders. Industry-wide collective bargaining is one outgrowth of this power.

"Power tends to corrupt, and absolute power corrupts absolutely." That great truth, phrased by the historian Acton, is as true of labor leaders as it is of business leaders, princes or potentates. It is also true that John L. Lewis and some of his fellow labor leaders now wield what approaches absolute power in their respective domains. Failure to recognize these facts and act on them can make a tragic mockery of the present opportunity to restore good sense and good order to our labor relations and our national life.

To realize this opportunity the labor monopoly must be made a major target.

In the minds of many people, particularly in the business community, the root cause of our labor troubles is to be found in the National Labor Relations Act, commonly called the Wagner Act. They feel that if they could get rid of the one-sided handling of a number of key labor problems provided by that act and its administrators, we would have the legislative part of the problem of creating good labor relations pretty well solved.

To be sure, there is occasion, long overdue, to balance up the lopsided treatment of labor relations by the Wagner Act and those who apply it. It has been so interpreted and applied as to deny free speech to employers. On occasion it has extended the special protection of the federal government to workers striking to force employers to break the law. It has done the same for workers striking to force the federal government to change its policy the way the strikers want it changed.

The Wagner Act has required employers to bargain with unions, but imposed no companion obligation upon unions to bargain with employers. It has given protection to workers who have broken their agreement by striking. It has been applied so as to break orderly lines of management by encouraging and giving special protection to union organization of foremen who, to do their work efficiently, must represent management. Abuses such as these should be cleaned up, and soon.

Monopoly is the Target

But if perfection were attained in eliminating all of the abuses stemming from the Wagner Act, numerous and grievous as they are, the basic problem of establishing the legislative foundations of sane and safe labor relations in the United States would by no means be solved. John L. Lewis and his fellow labor dictators would, no doubt, be annoyed, but their power would not be seriously impaired. *That power is derived from monopoly control of labor.* Just as in the case with any other kind of monopoly power, it will only be made subservient to the public interest by attacking it at the source and smashing it.

The way to do that is to apply the anti-monopoly laws to monopolies in the field of labor just as they are applied to business and industrial monopolies. At the same time more vitality should be pumped into these laws all along the line.

When our basic anti-monopoly law, the Sherman Antitrust Act, was passed in 1890, it was designed to apply to economic monopolies of all kinds, and was so held by the courts. Organized labor sought exemption from this law, largely on the ground that its bargaining power was weak, as compared with that of industrial corporations. In recent decisions, a majority of the United States Supreme Court

justices have held that, when combined with the Clayton Act of 1914, the Norris-La Guardia Act of 1932 gives organized labor virtually complete exemption from the antitrust laws.

In the meantime, the relative weakness in bargaining power which was made the occasion for exempting organized labor from the antitrust laws has become a myth. In soft coal, John L. Lewis is the monopolist. Through his United Mine Workers he controls about 90% of the miners. No one of the thousand or more highly competitive companies engaged in soft coal mining controls more than about 5% of the output.

In steel the monopoly control is that of Philip Murray's United Steel Workers whose organization represents well over 80% of the production workers in that industry. United States Steel, the corporate "giant," controls only about one-third of the steel making capacity. In automobiles the United Automobile Workers represent about 90% of the production workers. A year ago the union's officers flaunted their monopoly power by announcing plans to pick off one automobile manufacturer after another by a series of centrally controlled strikes.

Industry-Wide Bargaining

Confronted by the rise of government-fostered monopoly power in the hands of organized labor, employers in some industries have sought to match it by joining together for collective bargaining on a more or less industry-wide basis. In other industries, notably steel, the federal government, through the War Labor Board, took the lead in forcing a pattern of industry-wide bargaining. Bedevilled by a myriad of cases, the Board thus sought to settle scores of them in the steel industry by one action.

It is easy to understand how an employer, confronted by an industry-wide monopoly of labor, would be tempted to join with his fellow employers in an industry-wide bargaining group. In that way he might see a chance to establish something like equality in bargaining power.

However, if the employers' bargaining group were as effective as the union in creating a monopoly set-up, it would merely confront one monopoly with another. That, in turn, would heighten the chances of having either a devastating head-on collision as a result of failure to agree, or having the two monopolies reach an agreement at the expense of the consuming public.

Actually, however, the chances that employers can create an industry-wide bargaining group as tight as that created on the side of labor by union organization are virtually zero. For if a group of employers were to agree to shut down in unison or take other united steps to balance the bargaining power created by the threat of a monopolistic union to strike, they would unquestionably find themselves on the receiving end of an indictment for violation of the federal antitrust laws.

To Break the Monopoly

Thus, both from the point of view of the public and the point of view of the employer, industry-wide bargaining is no effective offset to the monopoly power created by industry-wide unions.

The only way to cope with this monopoly power is to subject it to the anti-monopoly laws in the same way business and industrial management are subjected. In the process industry-wide labor monopolies would be cut down to safe size, possibly by limiting the percentage of workers in any industry who are permitted to belong to a single labor organization.

Also application of anti-monopoly laws would clean out local pockets of labor monopoly which block the way of industrial progress. As matters stand, the freedom of unions from control by the antitrust laws permits organized workers in one city to refuse to install equipment shipped in from another city, thus establishing private tariff walls. It also permits organized workers to refuse to install or work on materials made by other workers whose union affiliation, or lack of it, they do not like.

If the anti-monopoly laws were applied to organized labor, boycotts of this sort would be outlawed. In the aggregate they now take a tremendous toll for no legitimate purpose. But primarily John L. Lewis and a handful of his fellow labor dictators might be cut down to a size that can be safely accommodated by the American democracy. If that is not done, the last great opportunity to give industrial and political democracy a chance to work, in its last great stronghold, will be lost. From such a tragic turn of events no one would lose more than the American worker.

President McGraw-Hill Publishing Company, Inc.

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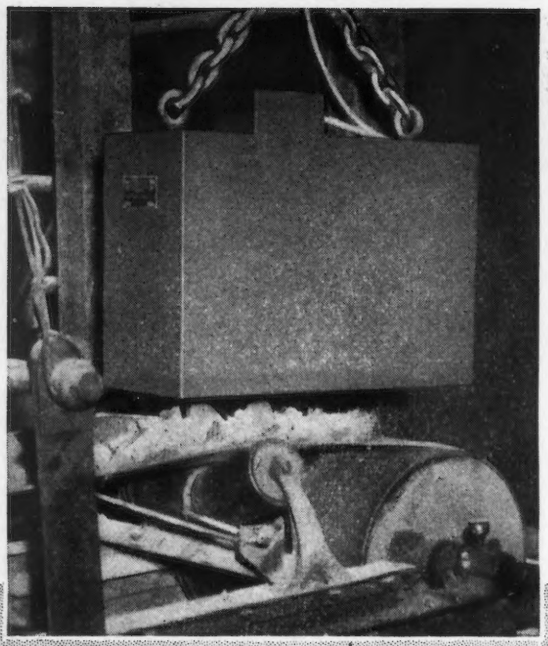

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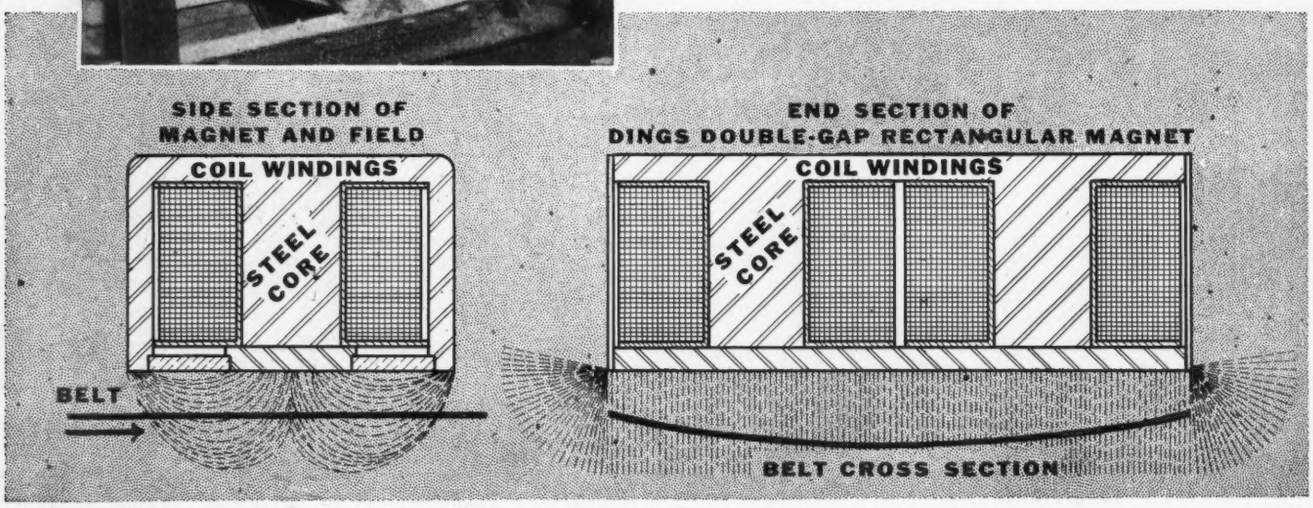
with Dings Rectangular Suspended Magnets

Left—Install Dings Rectangular Magnets over, or at the end of conveyor belts. Full range magnetic power covers entire belt width—gives powerful edge-to-edge protection against tramp iron.



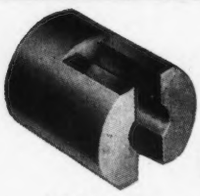
DINGS Double-Gap Rectangular Magnets give you full range protection against tramp iron by putting a powerful uniform magnetic field across the *entire width* of the conveyor belt . . . plus a field *long* enough to snatch tramp iron out of heavily-loaded, fast-moving conveyor belts. Double-gap magnet construction not only provides uniform magnetic strength, but is also the most powerful suspended magnet design available . . . allowing heavier belt loads at higher speeds while still maintaining positive, economical tramp iron removal.

Dings Catalog No. 301 contains full information on Rectangular Suspended Magnets. Ask for it today.

Dings Magnetic Separator Co.
4716 W. McGEOGH AVE., MILWAUKEE, 14, WIS.
"Separation Headquarters Since 1899"

Dings
"HIGH INTENSITY"

At left is shown how Dings Double-Gap Rectangular Magnet field provides concentrated magnetic strength along its entire length. At right is end-section of magnet showing why a Dings magnet no wider than belt may be used satisfactorily. Note full range magnetic power across entire belt width.

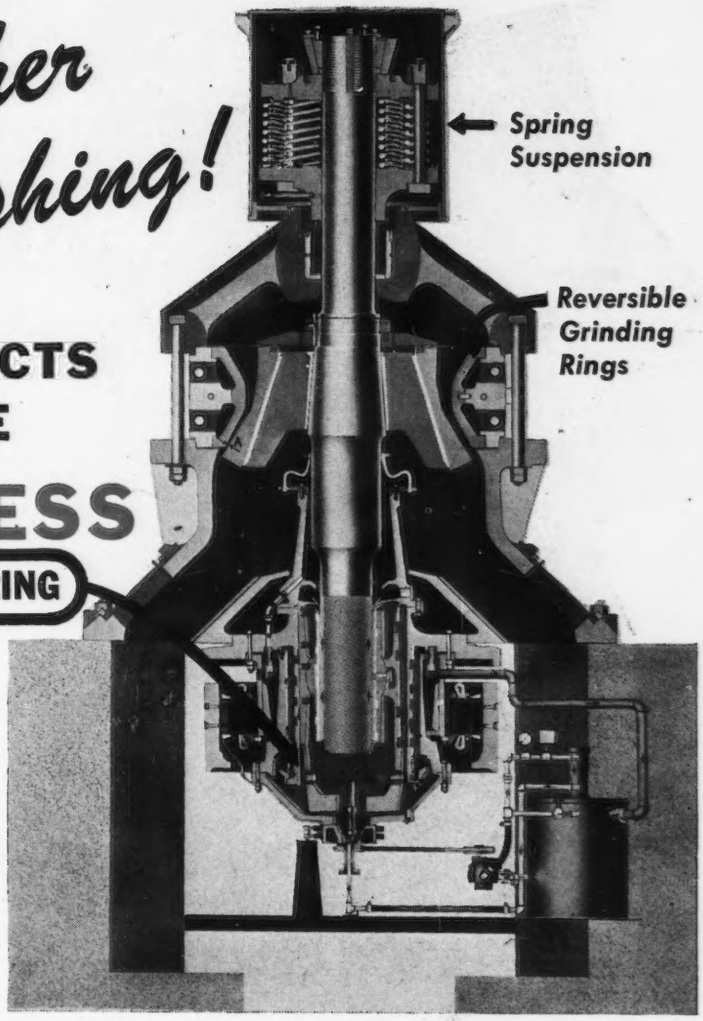


DINGS Magnetic Drill Extractor
Patent Pending
(Non-Electric)

• Removes broken drill rods and drill bits quickly and easily! Dings new Magnetic Drill Extractor is made of Alnico magnet steel . . . lifts 25 to 40 times its own weight . . . can be carried in a pocket . . . put to use in a few seconds . . . pays for itself in a hurry through holes and re-drilling saved. Write for data sheet containing full information . . . sizes and prices.

A Fine Crusher for Fine Crushing!

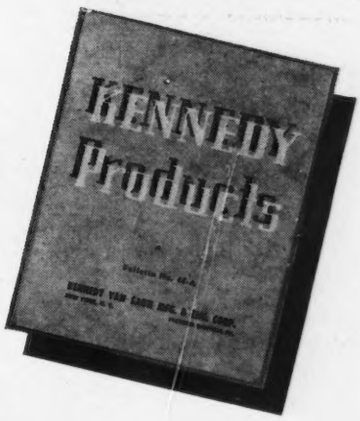
INSIDE FACTS ON THE KVS GEARLESS ROLLER BEARING



features:

1. Head secured to shaft by automatic self-locking device. 2. Liberal clearance under head for stone or ore. 3. *Noiseless* except for crushing of stone. 4. Shafts and heads suspended on springs that take up shock of "tramp-iron". 5. Crushing against solid anvil—no "spalls". 6. Spider arms are "H-section", reducing wear. 7. Alemite fittings with graphite grease protect lubrication in suspension ring, wearing ring, spider bushing. 8. Pressure per square inch on main bearings lowest of any gyratory crusher. 9. Air-cooled synchronous motor. 10. Grinding ring and mantle manganese steel. 11. Mantle can be made in 2 pieces so worn part is easily renewed. 12. Oil delivered to oil pot under pressure, passes up between shaft and ball sleeve. From there the oil is drawn down between eccentric and the bottom plate sleeve, then up between bottom plate and pulley sleeve to circumferential oil trough, then returns by gravity to cooling tank. From cooling tank it is pumped through a filter to oil pot. In this line there is a pressure gauge and electric switch, so that in the event of oil failure, relay shuts crusher down to prevent damage.

Send for BULLETIN 44A *for complete details*



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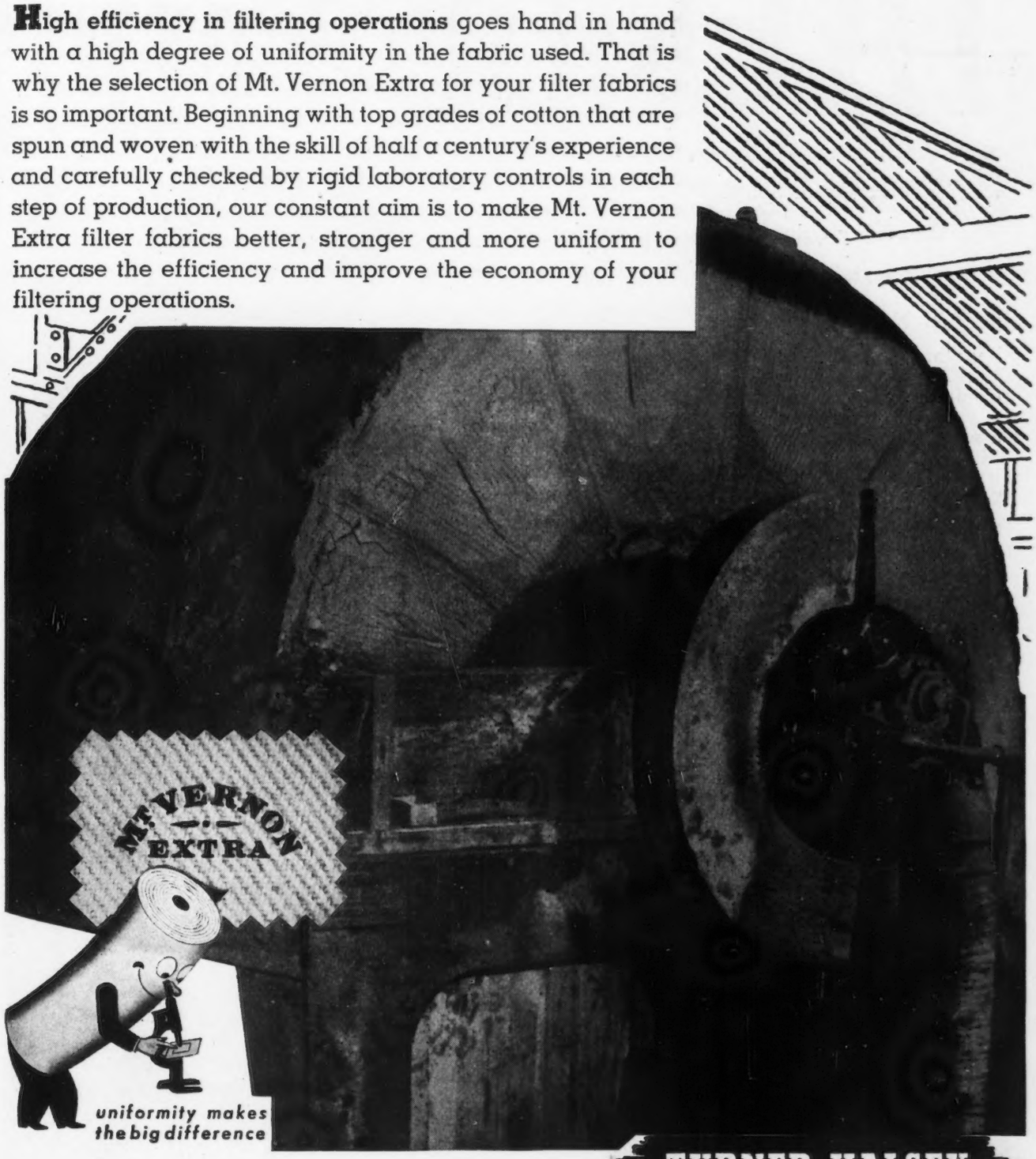

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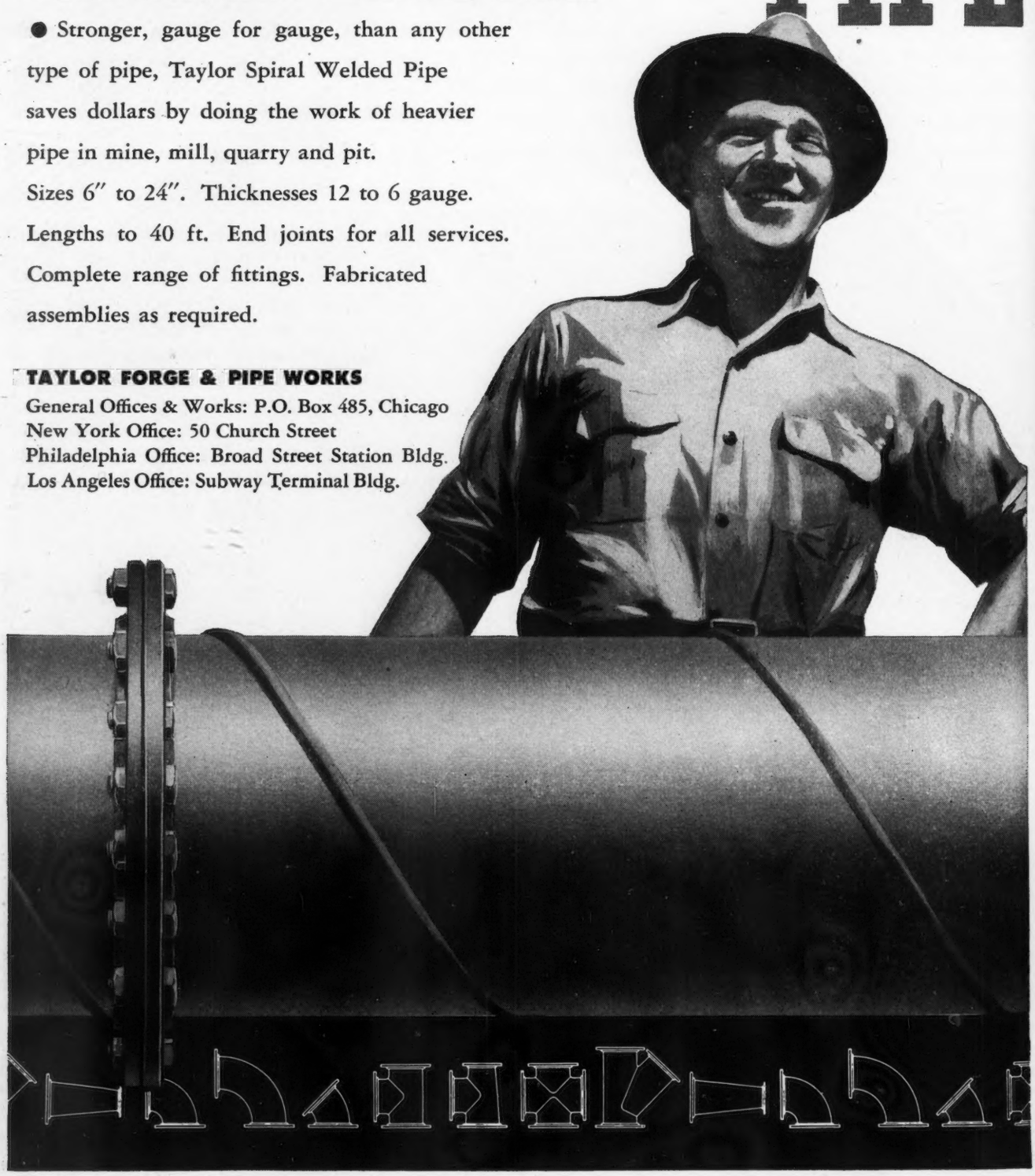

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1240

TYPICAL TESTS:

	No. 8	No. 12	No. 16	No. 20	No. 24	No. 32	No. 64
Flash Point, Clev.°F.	315	340	360	380	435	500	540
Viscosity 100°F. SSU	358	3390	5425	17160	49750	167500	347600
Viscosity 210°F. SSU	52	154	210	528	1060	3065	6075
Viscosity Index	71	75	80	100	104	115	119
Pour Point °F.	—30	—5	0	10	20	40	55
Solid Point °F.	—35	—10	—5	5	15	35	50
Gravity, API	35.4	32.0	31.0	29.8	27.9	26.0	25.0
Spec. Gravity	.8478	.8654	.8708	.8772	.8877	.8984	.9042
Lbs. Per Gallon	7.059	7.206	7.251	7.305	7.392	7.481	7.529
Molecular Weight	370	530	600	700	900	1200	1500
Neut. Number	.10	.10	.10	.05	.02	.01	.01
Sap. Number	.3	.3	.2	.2	.2	.1	.1
Carbon %	0	0	0	0	0	.01	.02
Sulphur %	.01	.01	.01	.02	.02	.02	.04
Sligh Oxidation Test	0	0	0	0	1	1	2
Color ASTM (Max.)	1½	1½	1½	2	2	2	2
Dielectric Strength	35,000	35,000	35,000	35,000	35,000	35,000	35,000

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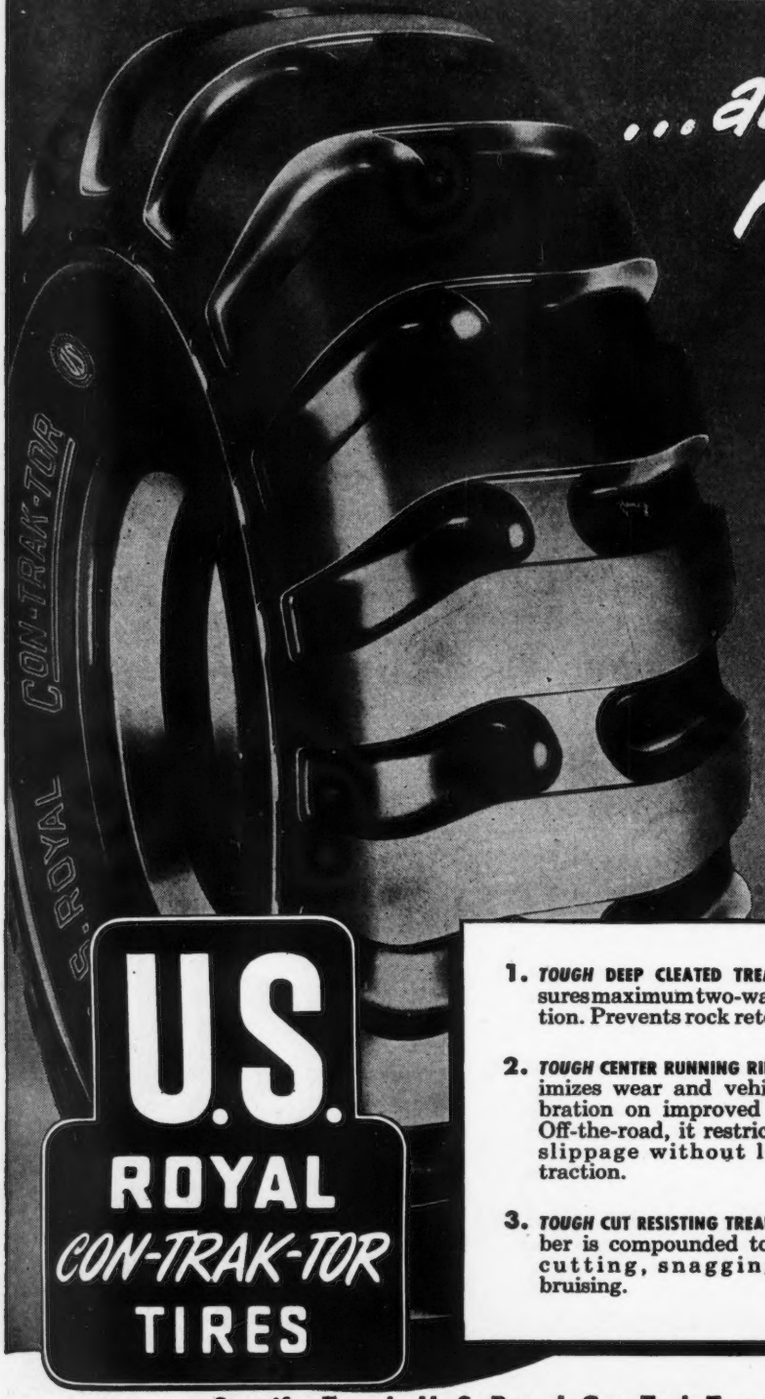

The rugged U. S. Royal Con-Trak-Tor is ready for the toughest kind of excavation, strip-mining, construction or logging work. It's built to *stand up* under heavy loads... to *keep going* over the roughest ground. See your U.S. Tire Distributor *now!*

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1. ***TOUGH*** **DEEP CLEATED TREAD:** insures maximum two-way traction. Prevents rock retention.
2. ***TOUGH*** **CENTER RUNNING RIB:** minimizes wear and vehicle vibration on improved roads. Off-the-road, it restricts side slippage without loss of traction.
3. ***TOUGH*** **CUT RESISTING TREAD:** rubber is compounded to resist cutting, snagging and bruising.
4. ***TOUGH*** **ROUNDED SHOULDERS:** minimize snagging and cutting and improve flotation in soft going.
5. ***TOUGH*** **EXCLUSIVE "U. S. SAFETY BONDED CORD"** construction, in which individual cords are "webbed" together—yet completely "insulated" one from the other, produces the strongest, longest lasting tire body possible.
6. ***TOUGH*** **SHOCK PAD CONSTRUCTION:** extra protection against ruptures and blowouts.

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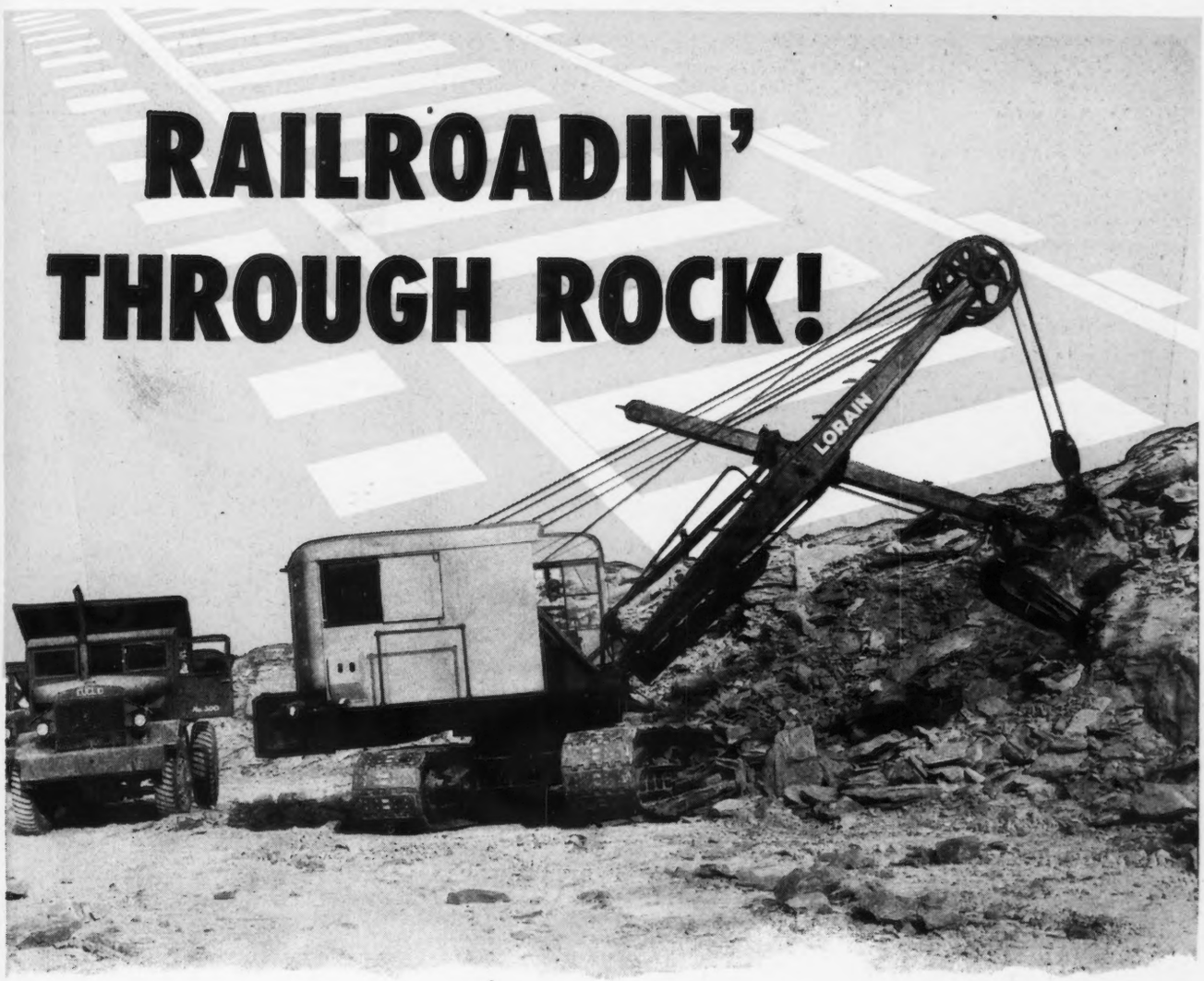
RAILROADIN' THROUGH ROCK!



THERE'S 1,500,000 yards of excavation on this railroad relocation contract and a good portion of it consists of tough limestone rock. Spearheading the job is this 2-yd. Lorain-820 shovel.

Why is the 2-yd. Lorain-820 a regular on the rock jobs? First, and foremost, because of its Hydraulic Clutch which (1) absorbs "rock shock" before its destructive action can reach mechanism and cables and (2) improves "hanging on" performance to the point where you can't stall the engine.

Add to this Thew pioneered feature the extra power of double Center Drive design on the turntable, the strength of an all-welded shovel boom and dipper stick and the stability and mobility of a big 2-speed chain drive crawler 15 ft., 6 in. long. Result? A fighting combination that has won every round against rock on many of the nation's toughest jobs.

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Reg. Trade Mark

thew-Lorain

THE THEW SHOVEL CO.
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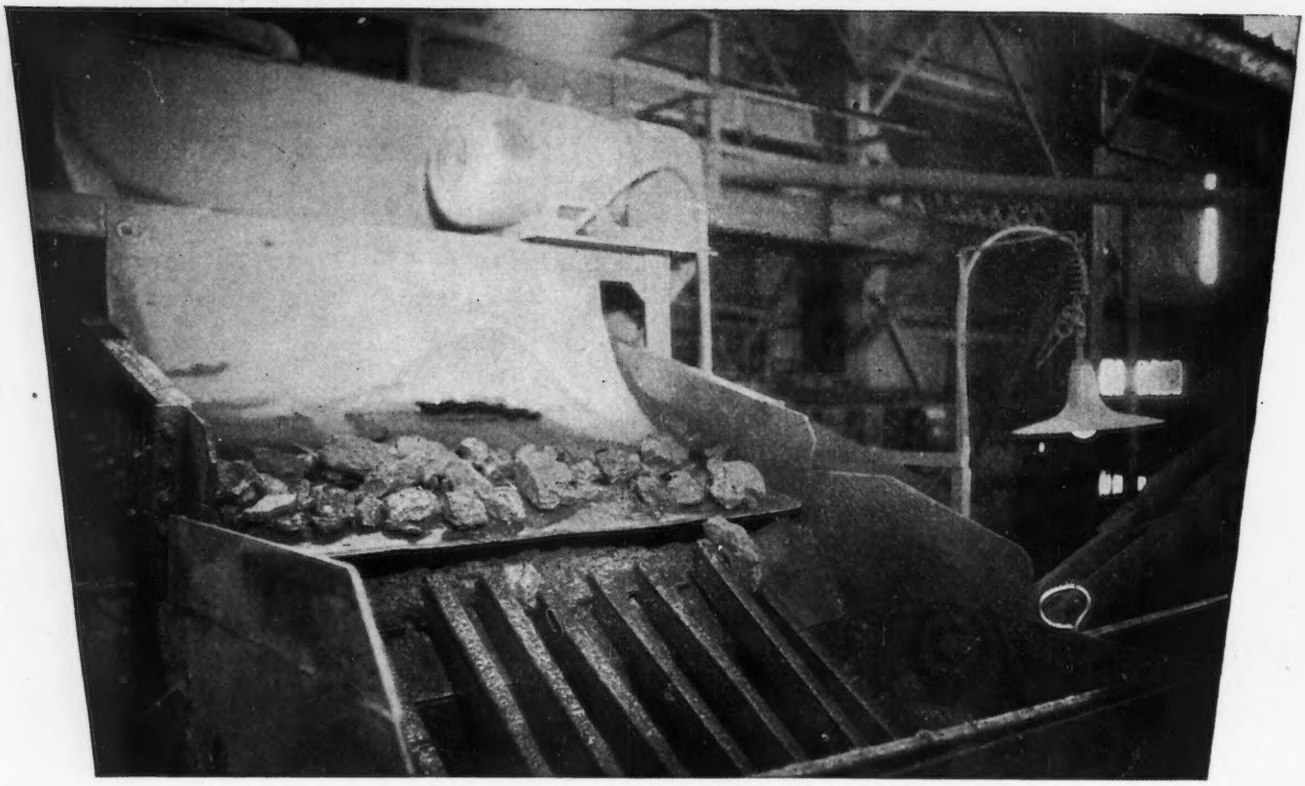

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Fully equipped with SKF Spherical Roller Bearings, this 5′ x 14′ Heavy Duty Scalper has operated in one of Minnesota's large iron mines for three full seasons, and has yet to undergo any overhaul or have any maintenance expense. That means something when you consider this unit, which is equipped with a 2″ square opening, handles an average capacity of 900 tons per hour with peak loads up to 1000 tons per hour. It means that SKF Bearings provide the rolling alignment, stamina, equalized load distribution, full load carrying capacity, long life, and many other advantages that make them the chosen bearings in all the fields of Industry. When *you* need bearings, check the trade-mark. Make sure it's "SKF". 6168

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POTASSIUM KF • HF BIFLUORIDE

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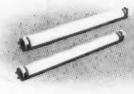
SOME POTENTIAL USES:

HEAT TREATING—Means of controlling the melting point of heat-treating salts.

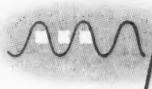
GLASS—In etching glass or other silicon-bearing products. As "frosting" agents.



CERAMICS—As opacifiers. As materials to increase the fluidity and alter the melting point of the mix.

CHEMICAL PROCESSING Source of HF in dry form. For preparation of elemental fluorine by electrolysis.

ELECTRONICS—Special medium for etching quartz crystals.



MINING—Agents for digestion of insoluble ores.

METALLURGY—As ingredients in fluxes and pastes for welding, brazing or soldering. For surface preparation of aluminum and stainless steel before spot welding.

General Chemical Fluorine Research announces Potassium Bifluoride and Potassium Polyacid Fluoride to American Industry. These are versatile, reactive products whose properties indicate varied applications. For example, consider their potentialities in the fields suggested here.

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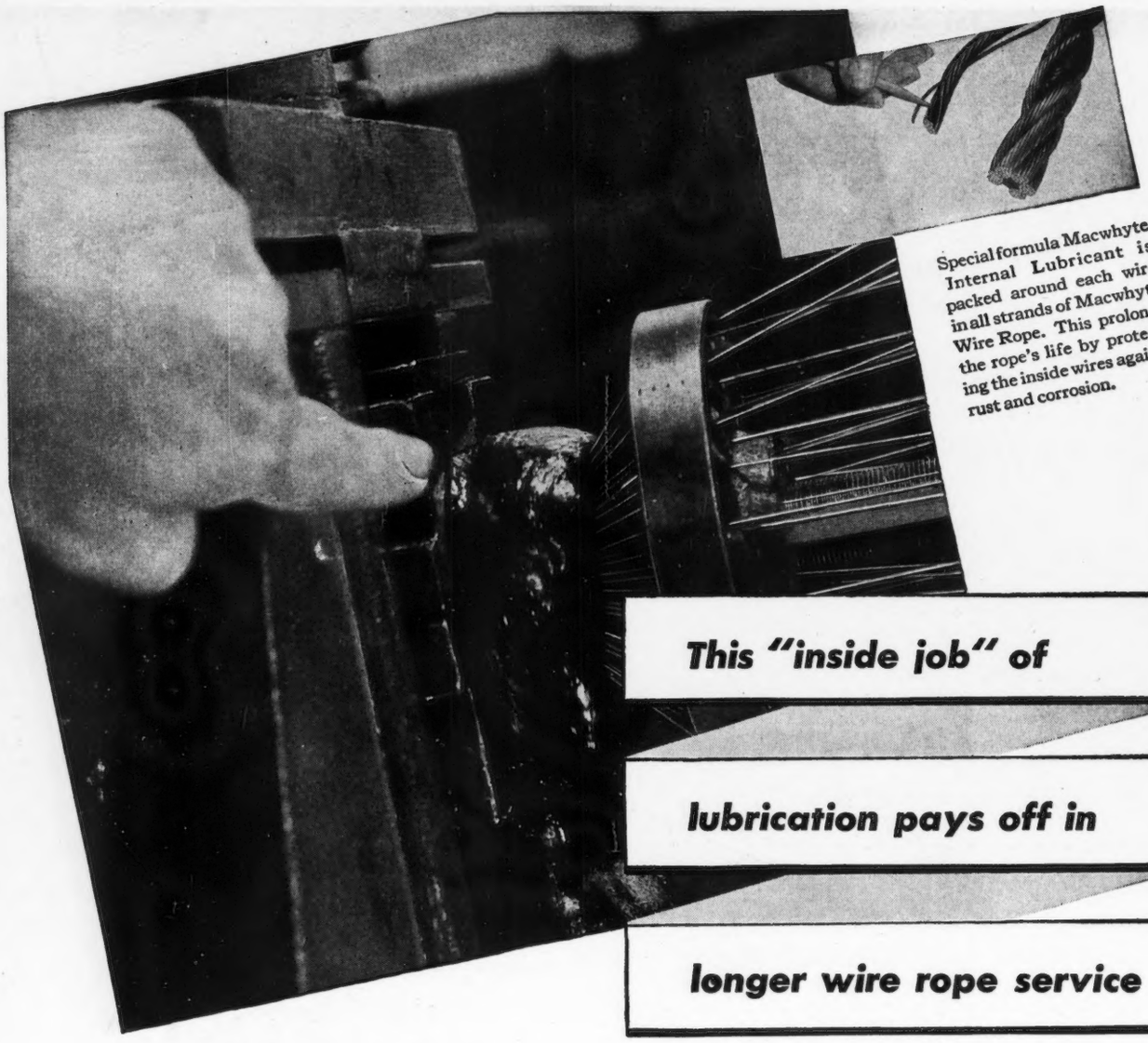

Special formula Macwhyte Internal Lubricant is packed around each wire in all strands of Macwhyte Wire Rope. This prolongs the rope's life by protecting the inside wires against rust and corrosion.

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Extra life, assured by superior internal lubrication, quality materials and precision manufacture, makes Macwhyte Wire Rope your best buy.

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In use everywhere for clearing, leveling, grading, and excavating ...All Gar Wood Road Machinery is specifically designed, engineered, and built to make the *toughest* jobs *easy*...and more profitable.

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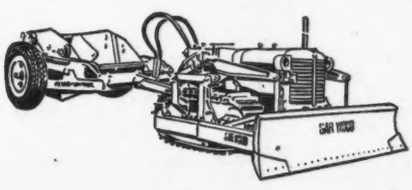
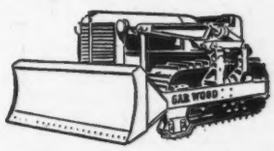




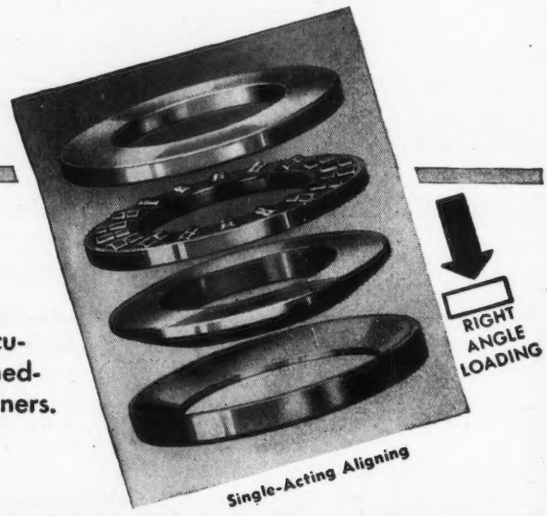
Prevent Wear & Tear under heavy duty thrust loads!..Where service conditions demand the best...Rollway Thrust Bearings stand up!

ROLLWAY *precision type*
Roller Thrust Bearings,
the Leader in HEAVY DUTY THRUST UNITS

Single-Acting

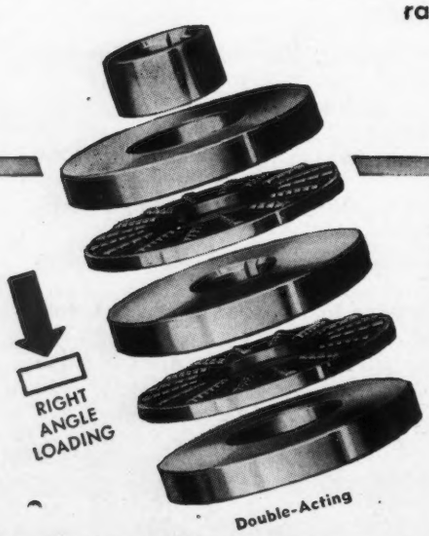
HERE'S WHY!

1 ROLLWAY carries all loads at right angles to the roller axes.



Single-Acting Aligning

2 ROLLWAY solid-cylindrical rollers — staggered in position and varied in length, so as to cancel out "tracking" — are accurately spaced in machined-bronze retainers.



Double-Acting

3 Thrust plates, held to extremely close limits of parallelism, afford a linear contact with the straight cylindrical rollers, doing away with Brinell effect and roller "pinch outs" with consequent roller-end wear and rubbing friction.

Six basic types in many sizes to choose from. Send a print or detailed description for free bearing recommendation.

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ROLLWAY CYLINDRICAL ROLLER BEARINGS

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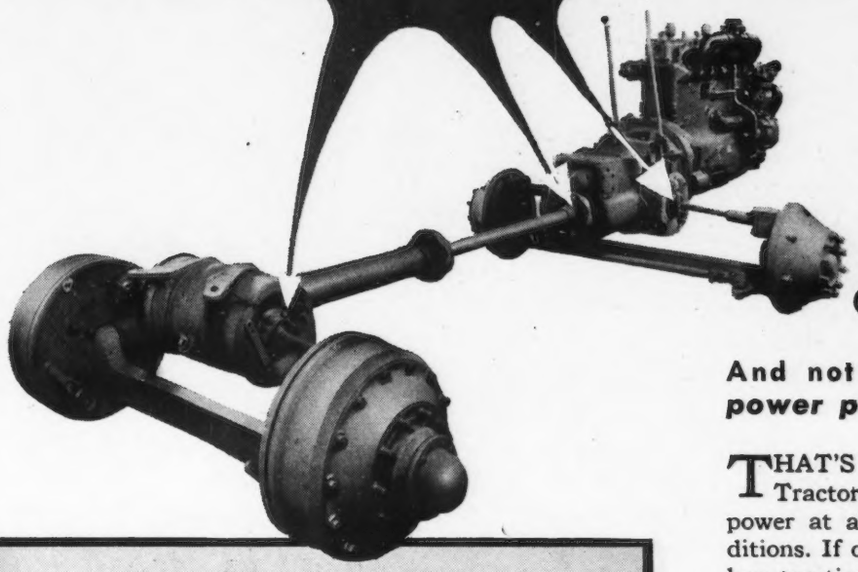
What a DIFFERENCE in tonnage these DIFFERENTIALS make!



Not just one -but three differentials

And not ordinary differentials but *power proportioning differentials*!*

THAT'S what makes it possible for Walter Tractor Trucks to maintain full tractive power at all times—regardless of surface conditions. If one, two or even three wheels should lose traction, these differentials concentrate the power on the remaining tractive wheel until full traction is regained. No power is wasted on slipping or spinning wheels—all power is effective, tractive power.

Because they exert more effective haulpower, Walter Tractor Trucks deliver more tonnage. They haul bigger loads faster than any other truck—on mine roads or off the road. They haul their huge loads up steep grades, over slippery surfaces, through soft dirt and deep mud. They keep on hauling when other trucks are stopped. Thus, Walter Tractor Trucks put more working days on your calendar. Write for a complete description.

**Also called automatic locking differentials. They proportion engine power to the four driving wheels according to the traction of each wheel at any instant.*

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WALTER TRACTOR TRUCKS

● Choice of engines from 125 h.p. to 350 h.p. ● Tractor Type Transmission with single lever speed selection ● Suspended Double Reduction Drive with hub-mounted internal gear for more efficient power transmission, higher ground clearance and greater protection of vital parts. ● Engine ahead of wheels for correct weight placement, short wheelbase, smaller turning radius. ● Hydraulic steering and powerful air brakes for easier handling, greater safety.

Walter Motor Truck Company
1001-19 Irving Avenue
Ridgewood 27, Queens, L. I., N. Y.

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PORTABLE ELECTRIC SAWS
DO BETTER WORK . . . EASIER and FASTER

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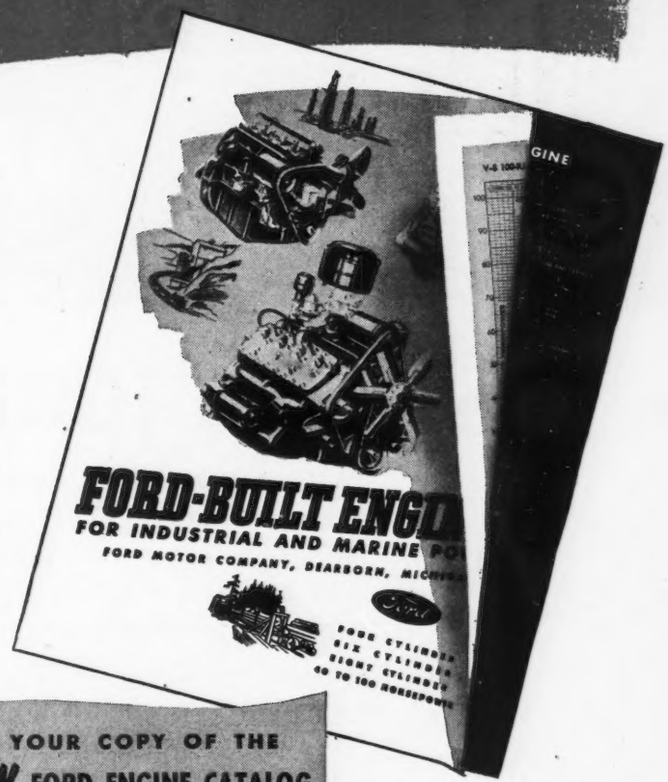
We invite you to write for your copy of the new catalog of Ford-built engines for Industrial and Marine use, if you have not already received one. It contains, besides the performance curves, all dimensional drawings, detailed specifications, standard and special Ford accessory equipment available, facts on Ford field service facilities and a list of present manufacturer-users of Ford engines.

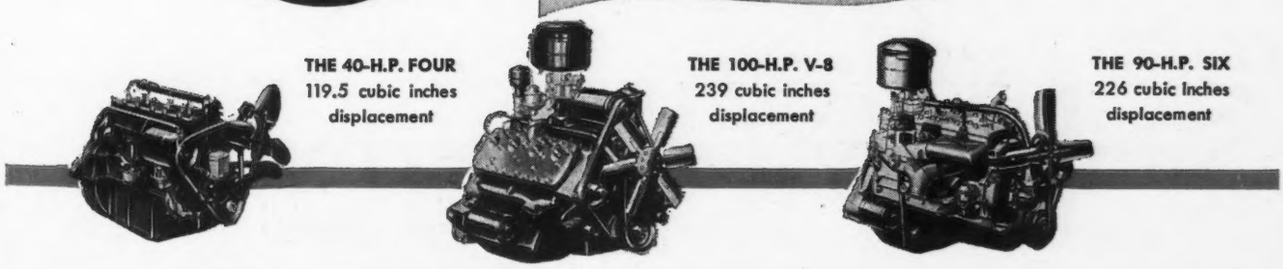
Why not exchange specifications with Ford before you make definite decisions on your engine requirements for 1947? Address—



FORD MOTOR COMPANY
Industrial and Marine Engine Department, No. 10
DEARBORN, MICHIGAN

Ford

YOUR COPY OF THE
NEW FORD ENGINE CATALOG
IS READY!



THE 40-H.P. FOUR
119.5 cubic inches displacement

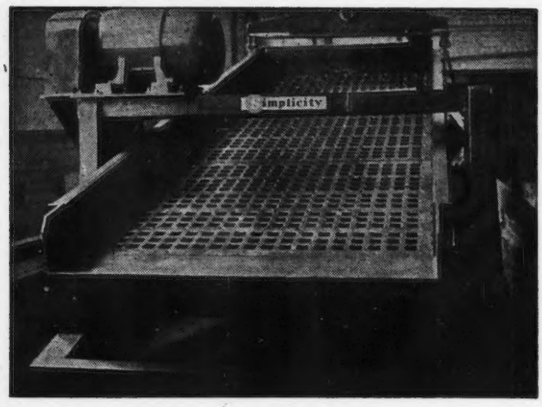
THE 100-H.P. V-8
239 cubic inches displacement

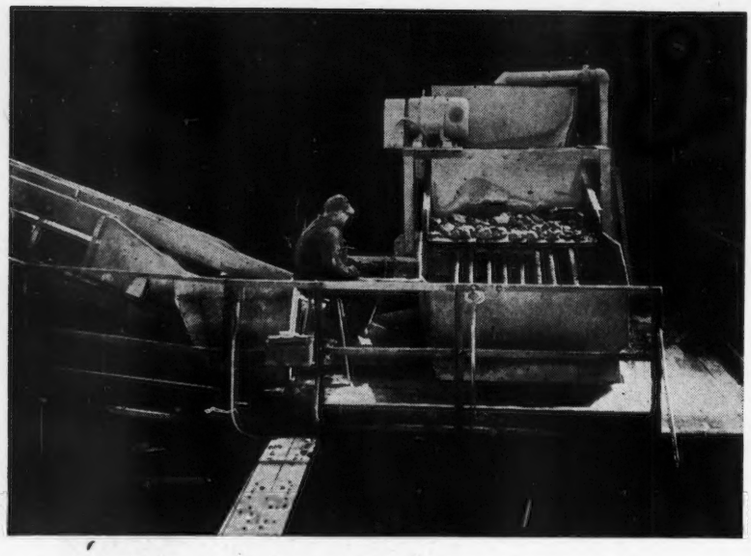
THE 90-H.P. SIX
226 cubic inches displacement

FOR INDUSTRIAL AND MARINE POWER

Simplicity

Scalper





averages

900 TONS PER HOUR!

• Peak Load-1000 tons per hour

The SIMPLICITY Heavy Duty 5′x14′ Scalper pictured here handles on an average of 900 tons of iron ore thru 2″ openings. Peak load is 1,000 tons per hour. This unit is suitable for scalping any type ore thru any size opening—capable of handling boulders up to 5′ diam.

This SIMPLICITY Scalper shown here has operated for three full seasons *without maintenance cost!*

SIMPLICITY Scalpers and Screens are performing in many other large Metal Mining plants, making every type of separation or washing operations required. Sizes available range from 2′ to 3′ up to 5′x14′ in single, double and triple decks.

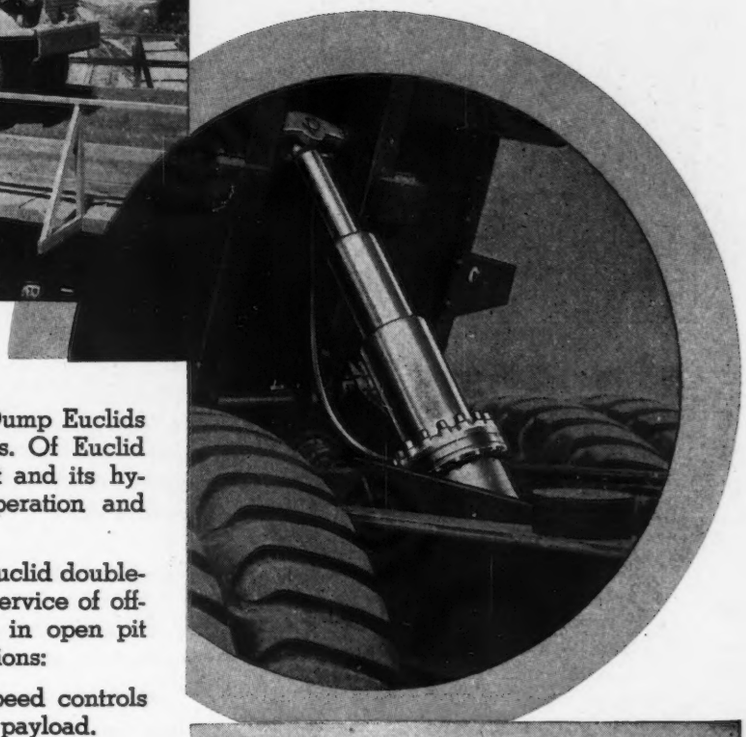
Secure our recommendations for your Screening or Scalping Problems.

Simplicity Engineering Co.

DURAND, MICHIGAN

FOR CANADA: WATROUS LIMITED, BRANTFORD ONTARIO • FOR EXPORT: BROWN & SITES, 50 CHURCH ST., N. Y.

EUCLID *fast-acting* HOIST *Speeds Dumping*



THE three-stage hydraulic hoist of Rear-Dump Euclids saves time and reduces hauling costs. Of Euclid design and manufacture, the powerful hoist and its hydraulic system provide fast, dependable operation and ample capacity for the rated payloads.

Here are some of the features that make the Euclid double-acting hoist unequalled for the heavy duty service of off-the-highway work on construction projects, in open pit mines and quarries, and on industrial operations:

Raises Loaded Body Fast . . . Engine speed controls dumping speed; ample hoist capacity for full payload.

Dumps the Load Clean . . . Hoist has 37" stroke which raises body to 70° from horizontal.

Provides Complete Control of Body . . . Conveniently located hoist valve has four positions: raise, lower, float, and hold. All or part of the load can be dumped according to job requirements.

Lowers Body Quickly . . . Hoist is double-acting in third stage . . . lowers the body under power to the point where it settles quickly by gravity.

Ask your Distributor or Representative to show you how all Euclid models, Rear-Dump and Bottom-Dump, are built throughout for efficient, long life in off-the-highway service.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO

A partial view of the Climax installation showing tops of the Multiclone units and by-pass ducts for maintaining constant gas volume.

HERE'S ANOTHER TYPICAL EXAMPLE of the vital savings Multiclones are making for industries of all types—wherever suspended materials or "values" are being lost in furnace or exhaust gases.

At Climax Molybdenum's plant in Langeloth, Pennsylvania, Multiclone Collectors are installed on the furnaces where the molybdenum sulphide concentrate is roasted to form molybdenum oxide. These collectors were installed to recover the finely divided material which leaves the furnace with the furnace gases.

An interesting feature of this installation is the method in which the piping is arranged to permit recirculation of gas through the Multiclones so that each collector can be operated at approximately constant volume and draft loss, regardless of variations in the actual gas volume from the furnaces.

The installation is of ample size to handle any conceivable production rate from the plant, yet permits maintaining uniform collection efficiency even when the gas volumes are greatly reduced. Multiclone's unusual adaptability to varying operating requirements is only one of its many important advantages.

OTHER VITAL MULTICLONE ADVANTAGES

UNUSUAL COMPACTNESS. Multiclones require as little as ⅓ the cubic footage required by other equipment of comparable capacity and performance.

SIMPLE INSTALLATION. Multiclones require only the simplest of duct work, thus simplifying both installation and maintenance of the unit.

HIGH RECOVERY. Because its multiple *small* diameter tubes generate higher centrifugal forces, a Multiclone recovers not only the coarse, medium and fine particles, but also a high proportion of the extra-fine particles of ten microns and less.

MAXIMUM ADAPTABILITY. Multiclone's inlet-outlet connections can readily be varied . . . its shape can be altered to fit various space limitations . . . and in many other ways it is unusually adaptable to varying installation requirements.

LET OUR ENGINEERS HELP YOU. No matter whether your recovery problem calls for mechanical collection (Multiclone) or electrical precipitation (Cottrell)—or a combination of the two, the unusually wide experience of our engineering department in all types of dust recovery problems is at your service. Write, wire or phone to our nearest office.

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

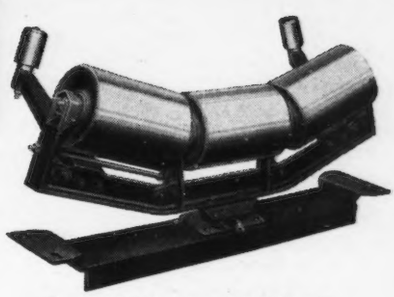
Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 140 S. DEARBORN ST., CHICAGO 3
HOBART BUILDING • SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

Send for this Multiclone Booklet.

Now Building
COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers
in all parts of the world—over 30 countries.

HOW YOU BENEFIT BY USING LINK-BELT SELF-ALIGNING BELT CONVEYOR IDLERS - - -

Reduce "Wear-and-Tear" of Belts—
Increase Operating Efficiency



Positive-Action type Self-Aligning Idler for one-direction belt travel.

Counterweighted-Disc type Self-Aligning Idler for reversing belt travel.

Positive-Action Self-Aligning Return Idler.

● Any slight misalignment of conveyor belts, resulting from off-center loading, strong side winds, unequal belt stretch, improper splicing, or material building up on the idler rolls, causes the Link-Belt positive-action type self-aligning idler to automatically contact an actuating roll. This swings the pivoted idler into a skewed position, thus gently but positively returning the belt to its proper running position on the conveyor idler roadbed. Actuating rolls yield easily and recede quickly from the belt so that the period of contact is short and without hard or continuous pressure which might injure the belt edges.

Link-Belt self-aligning idlers are made in two types, selection depending upon whether the belt travels in one direction only, or whether the belt conveyor is reversing.

Link-Belt makes all kinds of conveyors. Link-Belt Engineers have broad experience in the design, manufacture and application of conveying, materials handling and power transmission machinery, and can give you an impartial recommendation. Call or write the nearest office.

LINK-BELT COMPANY 9993

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

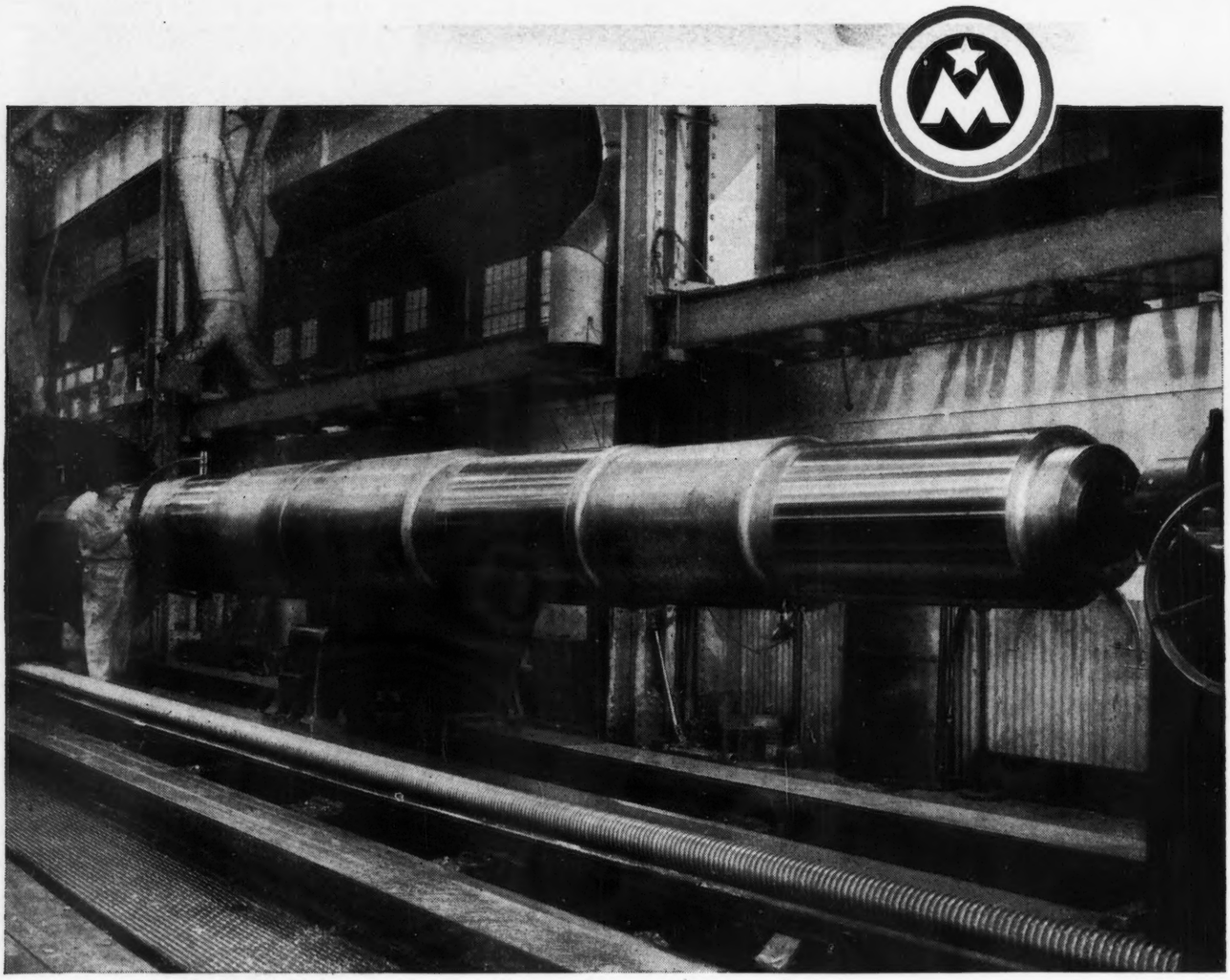
OTHER LINK-BELT PRODUCTS INCLUDE:

Conveyors and Elevators of all types — Belt, Apron, Pan, Bucket, Chain, Bulk-Flo, Flight, Oscillating-Trough, Screw, Sidekar-Karrier, etc. . . . Feeders . . . Vibrating Screens . . . Skip Hoists . . . Silent, Roller, Malleable Iron, Promal and Steel Chain Drives . . . Speed Reducers and Increasers . . . P.I.V. Gear Variable Speed Changers . . . Gears . . . Clutches . . . Couplings . . . Base Plates . . . Take-ups . . . Babbitted, Ball and Roller Bearings . . . Grease Cups . . . Safety Collars . . . Shafting, etc. — everything from one source to make your materials handling and power transmission machinery operate at peak efficiency. Send for Catalogs.

LINK-BELT

BELT CONVEYOR EQUIPMENT

IDLERS • TRIPPERS • BELTS • PULLEYS • BEARINGS • DRIVES



MORE THAN MEETS THE EYE . . .

This great, forged mine hoist shaft embodies extreme accuracy in every detail. Built perfectly to meet specifications demanding ability to withstand hundreds of tons of weight, this forging, like all Midvale forgings, passed through our quality control system. This, in effect, guarantees in melting, forging, heat treating and measurement an accuracy that has become the characteristic of Midvale manufacture.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

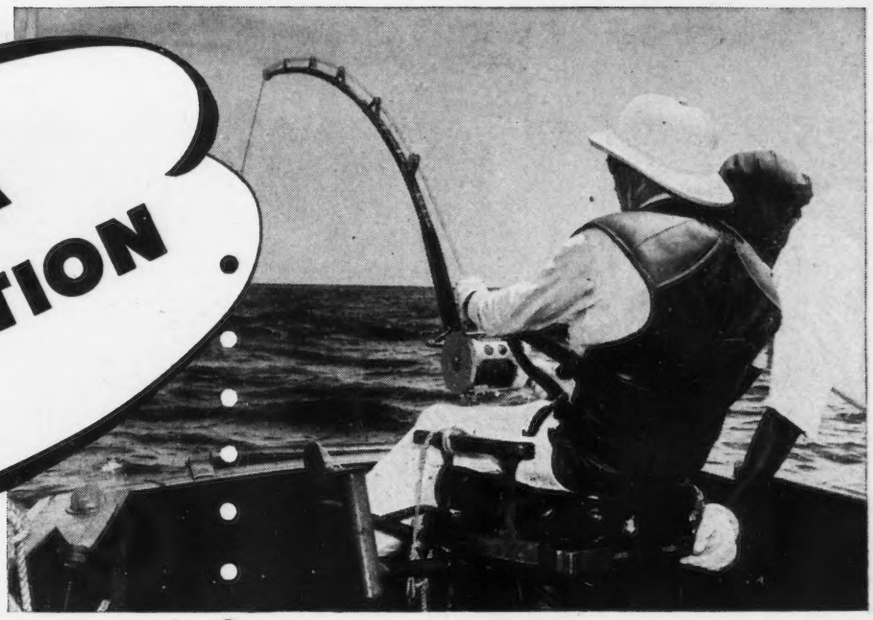
OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANCISCO

MIDVALE

Custom Steel Makers to Industry

STAINLESS AND TOOL STEEL BARS
•
CORROSION AND HEAT RESISTING CASTINGS
•
FORGINGS AND RINGS

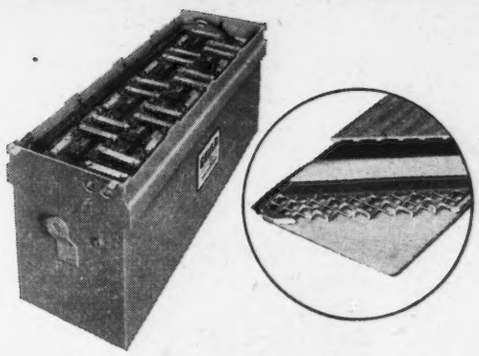
EXTRA PROTECTION



Gould Batteries Give Extra Protection

In Gould Kathanode Batteries all useful active material is retained in the grid

Just as deep sea fishermen wear a special harness to absorb the pull of big fish, so is Kathanode reinforced against the strains of charging and discharging in mine shuttle car service. For Kathanode this extra protection maintains capacity throughout the entire service life of the battery.



and here is the Reason why—

In Gould Kathanode each positive plate is faced with spun glass mats, held in place by a porous rubber envelope. This is the famous Kathanode Unit. It keeps the active material in place until it is entirely spent, where without this special construction the oxide would flake off before being spent, and settle to the bottom. Prove this yourself by comparing the sediment in a Gould battery with any other battery not having glass mats.

Get all the facts on Gould. Write Dept. 1412 for Catalog 300 on Gould Kathanode Glassklad Batteries for Mine Shuttle Car Service.

MEMO
General Manager—
Those Gould Kathanode Batteries are surely built to meet our rough shuttle car service.
BATTERY INSPECTOR

GOULD KATHANODE BATTERIES

GOULD STORAGE BATTERY CORPORATION, Depew, N. Y. Service Centers: Atlanta • Boston • Buffalo • Chicago • Cincinnati • Cleveland Detroit • Kansas City • Los Angeles • New York • Philadelphia • Pittsburgh St. Louis • St. Paul • San Francisco • Seattle • Zanesville

100,000 CUBIC FEET OF EARTH MOVED...

at a fuel cost of $2.10

This Northwest Dragline . . . powered with a 25 horsepower Sheppard Diesel . . . moved more than 100,000 cubic feet of dirt and tough sod in 35 hours while cutting a road bed to the new Naval Hospital at Houston, Texas. The fuel for the job cost just $2.10 !

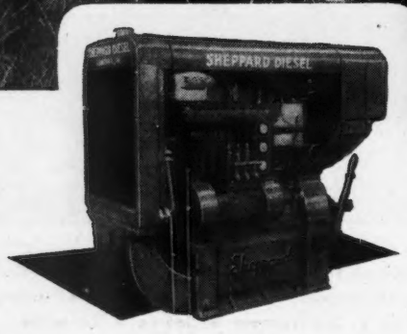
Operator Jack D. Johnson swears by the Sheppard . . . the way it takes the strain of heavy work, the shock of sudden load changes without dragging or racing. He declares that he has never used an engine that started so easily. And he likes the excellent Sheppard engine mounting which eliminates the usual noise and vibration of drag line work . . . leaving him fresher at the end of the day.

Johnson's employers . . . the Bruhn Trucking Company of Houston, Texas . . . say that with its remarkable fuel economy and lowered maintenance cost, the Sheppard Diesel will quickly pay for itself. They are mighty glad their dealer recommended that they repower with Sheppard, the compact, dependable, economical power plant. 16-page booklet shows many applications of Sheppard Diesel Power. Your copy will be forwarded on request.

Power Units, 3¾ to 56 continuous H.P. fully equipped Generating Sets, 2,000 to 36,000 watts

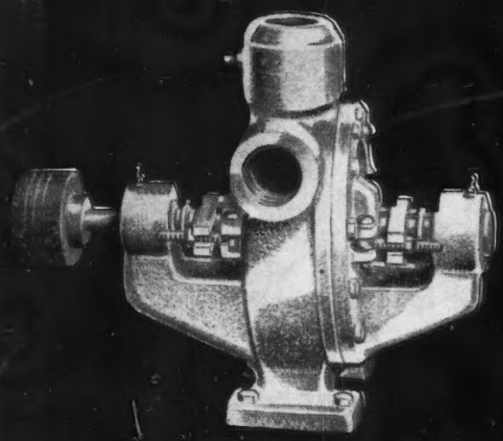
R. H. SHEPPARD COMPANY, INC.

12 Middle Street, Hanover, Pa.



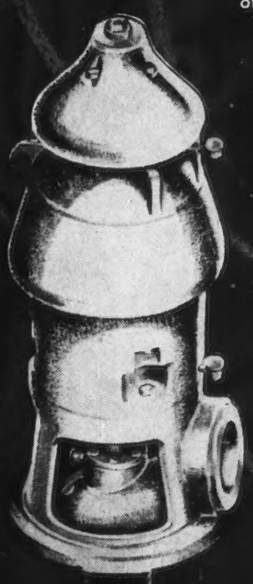
DIESEL'S THE POWER...

Sheppards' the Diesel



THE WESTCO LINE of precision-built pumps: unique advantages in long-life and varieties of use for small-capacity pumping of all types of liquids. High heads, low speeds.

FAIRBANKS-MORSE split-case centrifugals are first in their class for sustained high efficiency.



Impartially Yours . . .

for lower cost fluid-handling

When you are after lower cost liquid-moving, you want 100% impartial advice from men with second-to-none records of applying the right pump to all types of water-handling jobs! For this kind of engineering service—*and for a complete line from which you may choose*—there's no substitute for Fairbanks-Morse. Here's a single source for all your centrifugal, turbine, and special pumping needs—one "pump store" to simplify your pump-selection and servicing problems to the vanishing point!

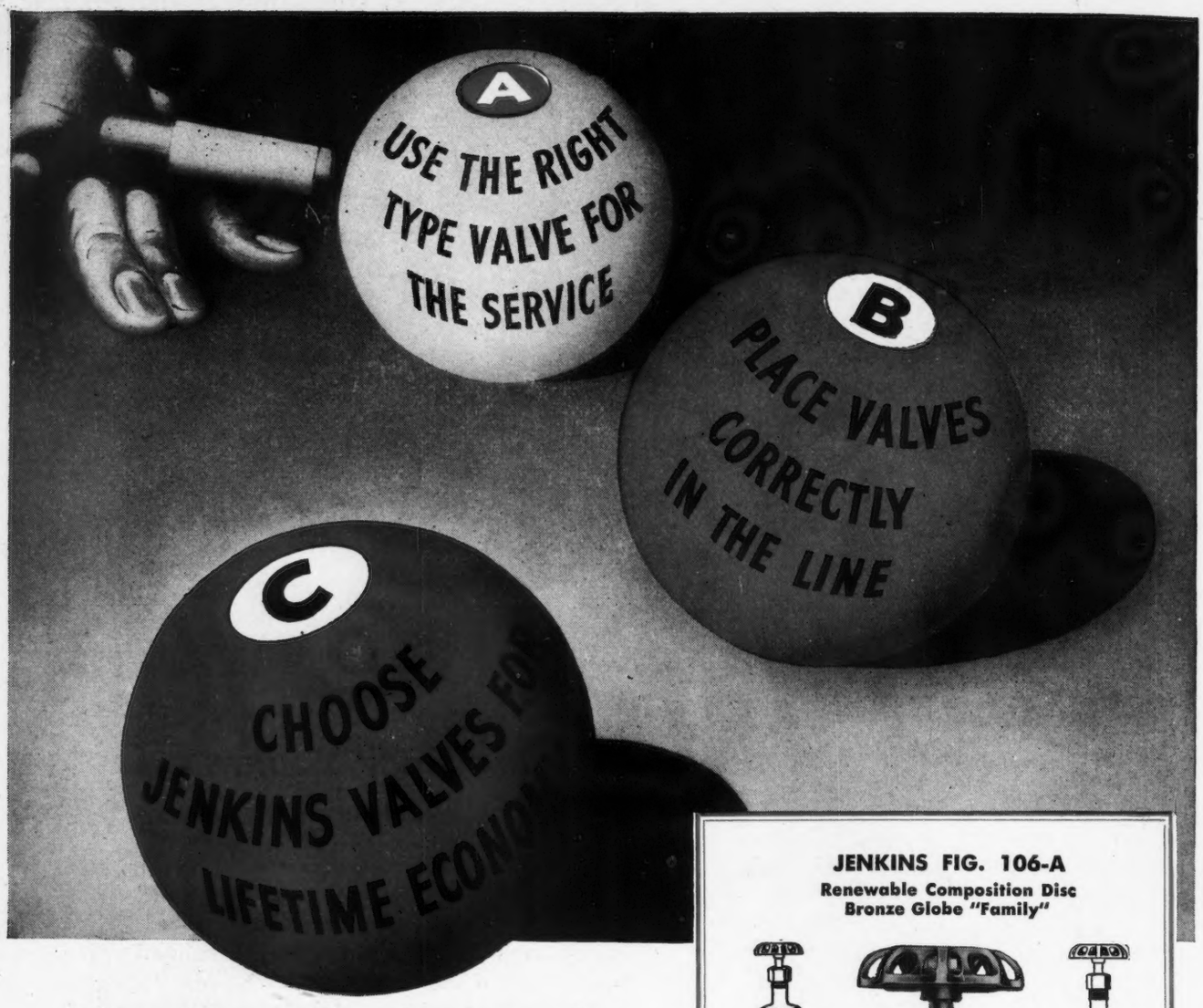
FOR VERTICAL TURBINE WORK—the complete line of Fairbanks-Morse and Pomona turbine pumps. At home—and well-proved—in farm or factory.

IF YOU'RE AFTER any of these advantages, see your Fairbanks-Morse dealer or call the nearest Fairbanks-Morse office.

FAIRBANKS-MORSE

A name worth remembering

DIESEL LOCOMOTIVES · DIESEL ENGINES · MAGNETOS · GENERATORS · MOTORS · PUMPS
SCALES · STOKERS · RAILROAD MOTOR CARS and STANDPIPES · FARM EQUIPMENT



The right angle of approach to lower valve costs

Line-up your valve-buying sights on the Jenkins 3-Point Formula and score money-saving valve economies.

By specifying Jenkins Valves when new valves are needed, you get the product of valve *specialists* whose ability to build *extra value* into valves has been recognized for over 80 years. You also get the experienced assistance of Jenkins top-rated valve engineers on any question of selection or placement.

Base your valve buying on the 3-Point Formula and get *extra* value which means *lowest cost in the long run.*

Jenkins Bros., 80 White Street, New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal, Canada; London, Eng.

SINCE 1864

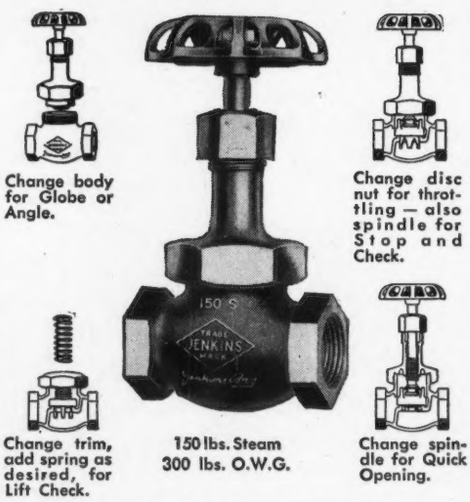
JENKINS VALVES

For every Industrial, Engineering, Marine, Plumbing-Heating Service . . . In Bronze, Iron, Cast Steel and Corrosion-resisting Alloys . . . 125 to 600 lbs. pressure

Sold Through Reliable Industrial Distributors Everywhere

JENKINS FIG. 106-A

Renewable Composition Disc
Bronze Globe "Family"


Change body for Globe or Angle.
Change disc nut for throttling — also spindle for Stop and Check.
Change trim, add spring as desired, for Lift Check.
150 lbs. Steam
300 lbs. O.W.G.
Change spindle for Quick Opening.

The Fig. 106-A "family" permits valve combinations for 90% of average needs through interchangeability of parts. With only four body types and a handful of parts, over 26 different types of valves can be assembled. Equipped with the slip-on stay-on disc holder, Fig. 106-A can be restored to good-as-new service in a few minutes.

For economy, versatility, ease of maintenance – Jenkins Fig. 106-A "family" leads the field.

ONE OF OVER 600 *EXTRA VALUE* VALVES MADE BY JENKINS VALVE *SPECIALISTS*

Get the Most out of Your Ore with

PENTASOL AMYL XANTHATE (Z-6)

Of all the Xanthates, the Amyls are known to have the highest collector power. Pentasol Amyl Xanthate (Z-6) is a blend of 5 Sharples Amyl Alcohols (mining grade), and its great collector power enables you to increase your output in 3 different ways:

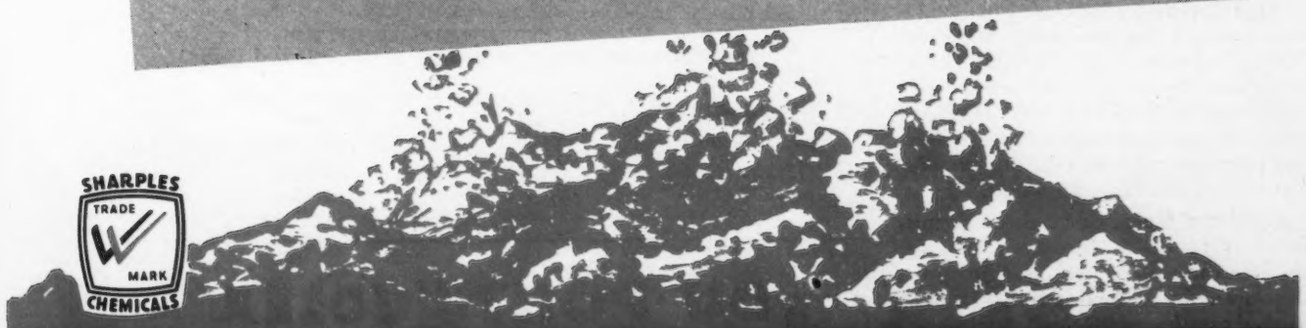
(1)—By reworking old tailing dumps at very low flotation costs.

(2)—By working low-grade ores, recovering values formerly deemed impossible.

(3)—By increasing recoveries from ores already yielding good percentages.

★ ★ ★

A test run with Sharples Pentasol Amyl Xanthate will prove these points. The commercial product is Bear Brand Z-6, manufactured by Great Western Division, The Dow Chemical Company. Samples will be sent to you on request.



SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC. PHILADELPHIA - CHICAGO - NEW YORK

ABOVE—Inspecting result of "Gelex" blast shortly after charge was fired. Note the excellent fragmentation of ore and presence of water in foreground.

AT RIGHT—Loading a charge of "Gelex" No. 2 in zinc lead mine in central Colorado. Du Pont blasting Caps are also used.

"Gelex" gives you

ECONOMICAL BLASTING IN HARD ROCK ORE MINING

In many hard rock ore mines, Du Pont "Gelex"—the widely used semi-gelatinous dynamite—has led to economical blasting. Its cost per 100 lbs. is lower than that of most gelatin grades, and it has a higher stick count.

Mine foremen and superintendents have learned that the performance of "Gelex" compares favorably with that of gelatin dynamites. Under ordinary conditions it gives excellent fragmentation of ore and rock . . . facilitates mucking and reduces wear and tear of mechanical loading equipment.

Minimum fumes of "Gelex" permit an early return to the face. Waiting time on the shift is low . . . high production is maintained. Packed in perforated cartridges, "Gelex" requires no slitting. It stays put in uppers . . . raveling is eliminated, and the possibility of headaches is reduced. Good water-resistance allows loading and firing "Gelex" even when very wet conditions are encountered.

In addition, "Gelex" is highly effective for mudcapping or paste-shots where secondary shooting is necessary. *You* may find "Gelex" both advantageous and profitable in *your* mine. Ask any Du Pont Explosives representative for complete information about this popular dynamite. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

PROPERTIES OF "GELEX" COMPARED WITH SPECIAL GELATIN

	Bulk Strength	Stick Count*	Water-Resistance	Fumes
"GELEX" No. 1	60%	136	Good	Excellent
Special Gelatin	60%	123	Excellent	Excellent
"GELEX" No. 2	45%	150	Good	Excellent
Special Gelatin	40%	114	Excellent	Excellent

*Stick count based on 1 1-8 x 8 inch cartridges varies within limits of 3 per cent.

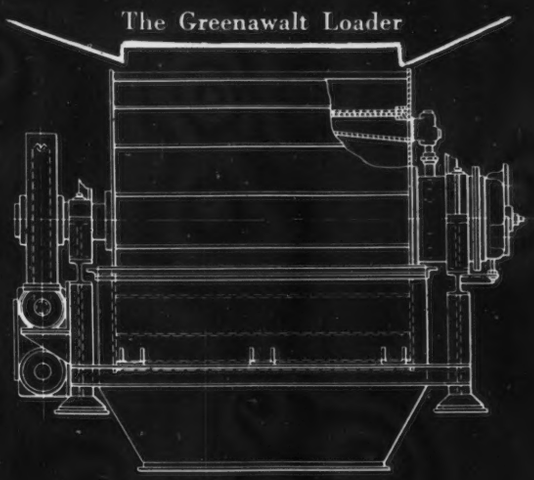
DU PONT "GELEX"

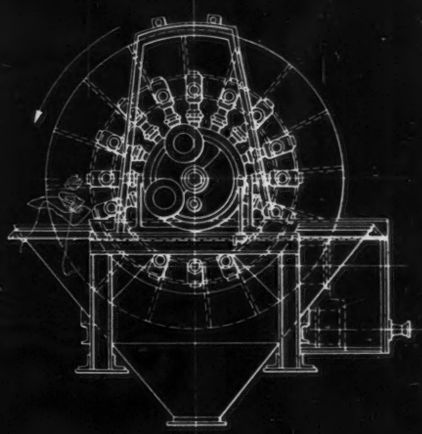
A product of Du Pont Explosives Research

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

The Greenawalt Loader





EFFECTIVE DEWATERING

OF HIGH DENSITY SLURRIES

OTHER GENERAL AMERICAN PRODUCTS

DRYERS
FILTERS
TURBO-MIXERS
THICKENERS
BINS
STORAGE TANKS
KETTLES
LADLES
STEEL STACKS

The Conkey Rotary Hopper Vacuum Dewaterer, in combination with the Greenawalt Loader*, increases processing of difficult-to-handle high density slurries, thus cutting dewatering costs to a minimum and eliminating the necessity for stock piling with the high cost of rehandling.

Relatively high drum speeds, capacity for extra-thick cake, plus uniform distribution of feed at low dilution by the Greenawalt Loader over the entire surface of each hopper allows the maximum quantities of solids to be dewatered per cycle with smaller water removal requirements. In addition, since no adjustments of feed consistency are necessary, continuous automatic operation with little supervision results.

Write for Bulletin No. 101 and get the details on this effective cost-cutting combination.

**Patents Applied For*

General American
TRANSPORTATION CORPORATION
process equipment • steel and alloy plate fabrication

SALES OFFICE: 10 East 49th St.
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OFFICES: Chicago, Louisville, Cleveland, Sharon, Orlando, St. Louis, Salt Lake City, Pittsburgh, Washington, D. C.

LOW OPERATING COST

Modern engineering principles built into every LIMA shovel, crane and dragline make low operating costs possible.

INDEPENDENT OPERATIONS (WITH ★ AIRCONTROL)

Hoist, swing, travel and boom up or down simultaneously—an extra value feature.

It's all in the Name

MAN OBILITY

The crawlers are long and wide to afford sure footing on soft or uneven ground. They steer from the cab with cab in any position.

ANTI-FRICTION BEARINGS

All drums and important shafts rotate on anti-friction bearings—the modern means of reducing costly friction.

★ DOES NOT APPLY TO THE ¾yd. PAYMASTER

LIMA

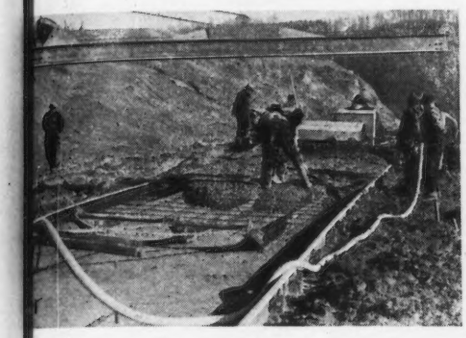
LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division

LIMA, OHIO, U. S. A.

Contractors, Quarriers, Miners *Prefer* MODERN, WELL-BALANCED *Condor* HOSE

Manhattan makes a completely engineered line of hose that has consistently helped to lower costs and speed up schedules. Development of Condor hose constructions has kept pace with advancing methods of operation for more than half a century and today, as always, the Condor line sets the standard for rubber hose. Three factors that make Condor hose "the better buy" are (1) FLEXLASTICS—Manhattan's own rubber compounds, (2) STRENGTH MEMBERS—special construction features, (3) MANUFACTURE and DESIGN—53 years of high standards.



Condor HOMO-FLEX WATER HOSE gives exceptional service on rugged road work where hose is constantly twisted and dragged over rough ground, rocks, stakes, etc. Safe at working pressures of 150 to 350 lbs. per square inch according to diameter.

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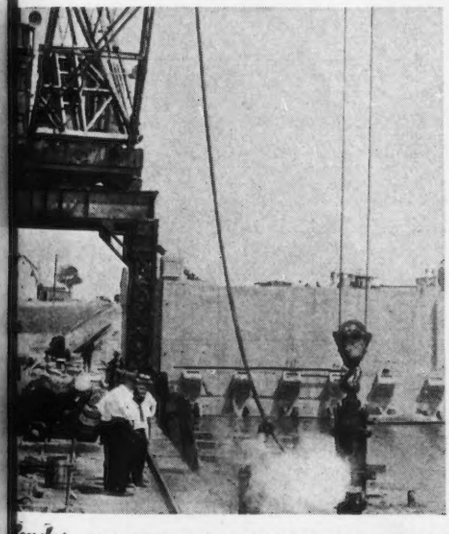

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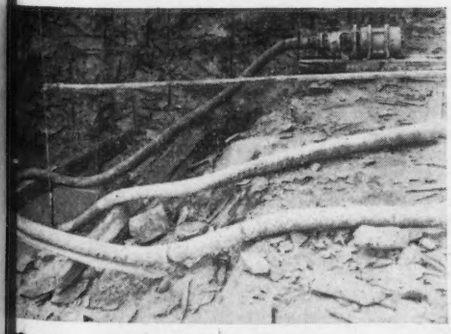

Condor HOMO-FLEX SUCTION HOSE, non-metallic reinforced, for safety in mines and for general service. Returns to original shape if crushed.

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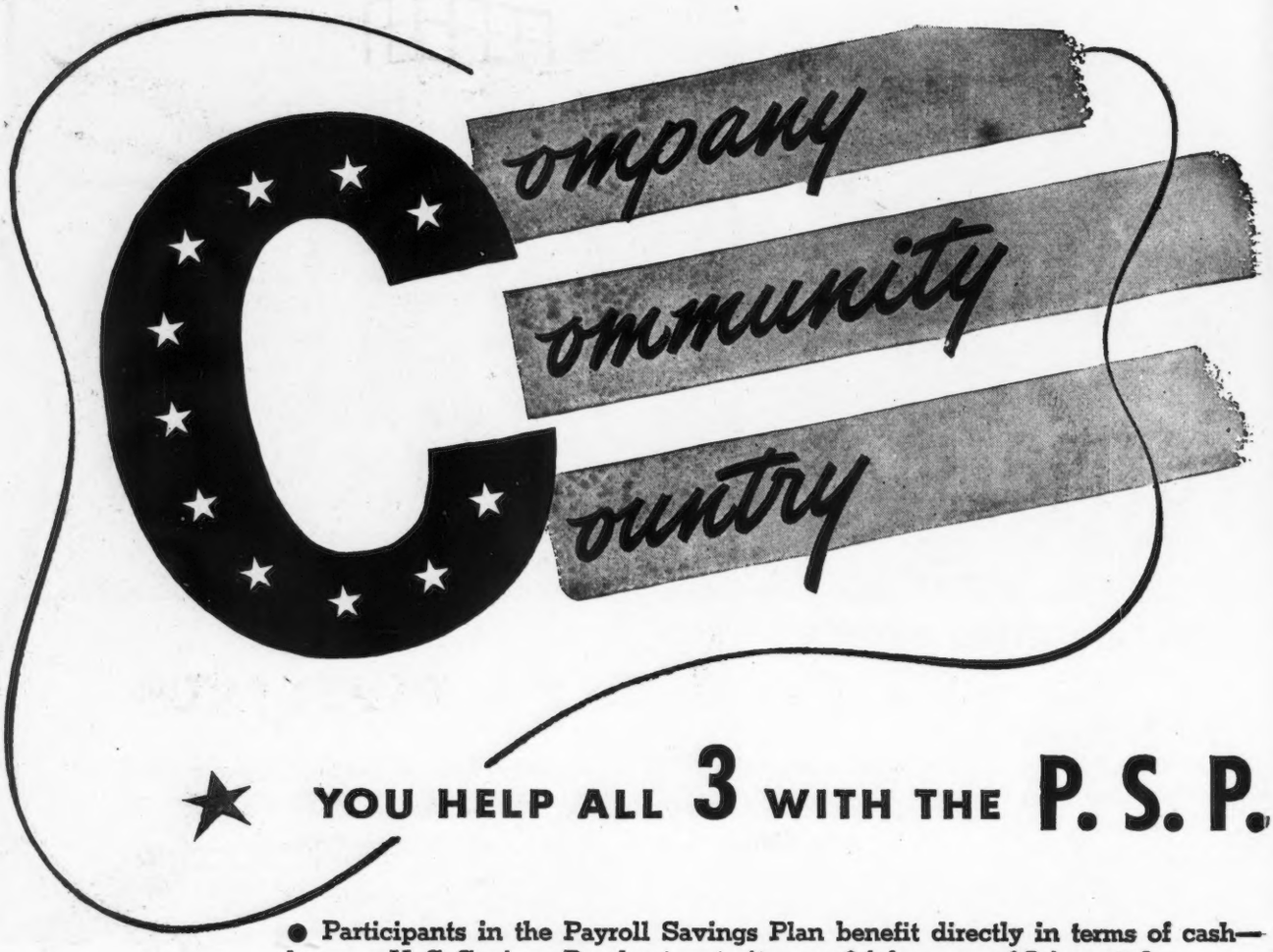

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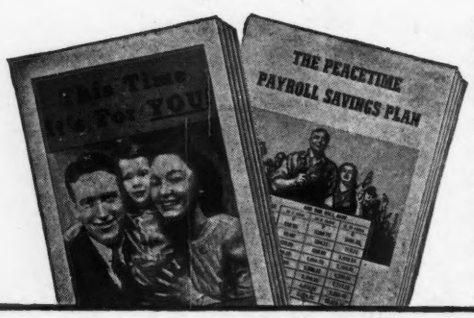

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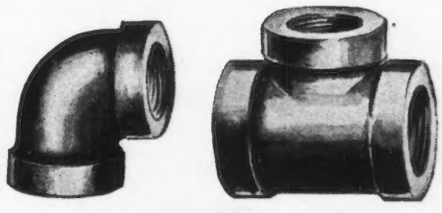

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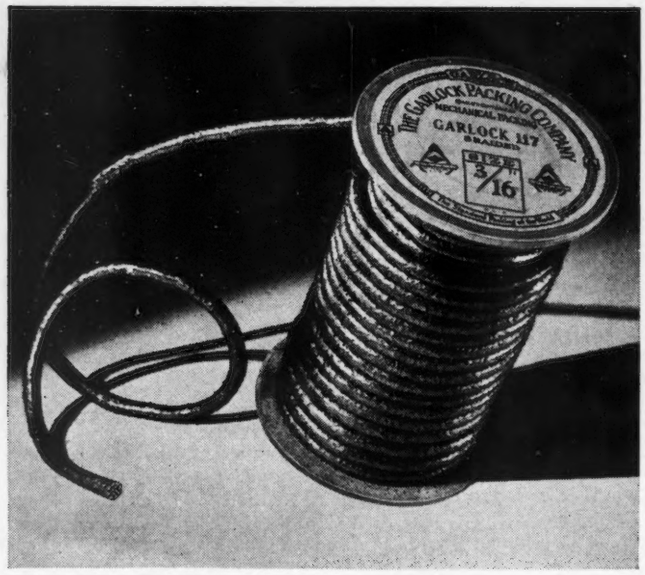

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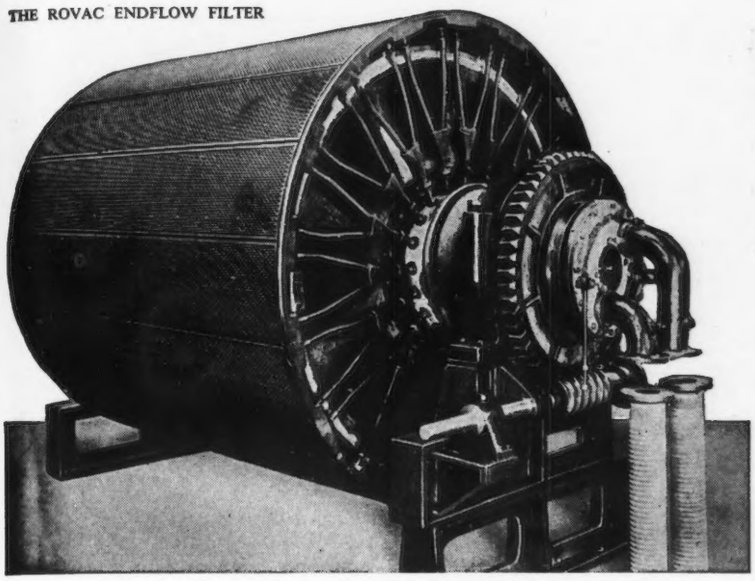

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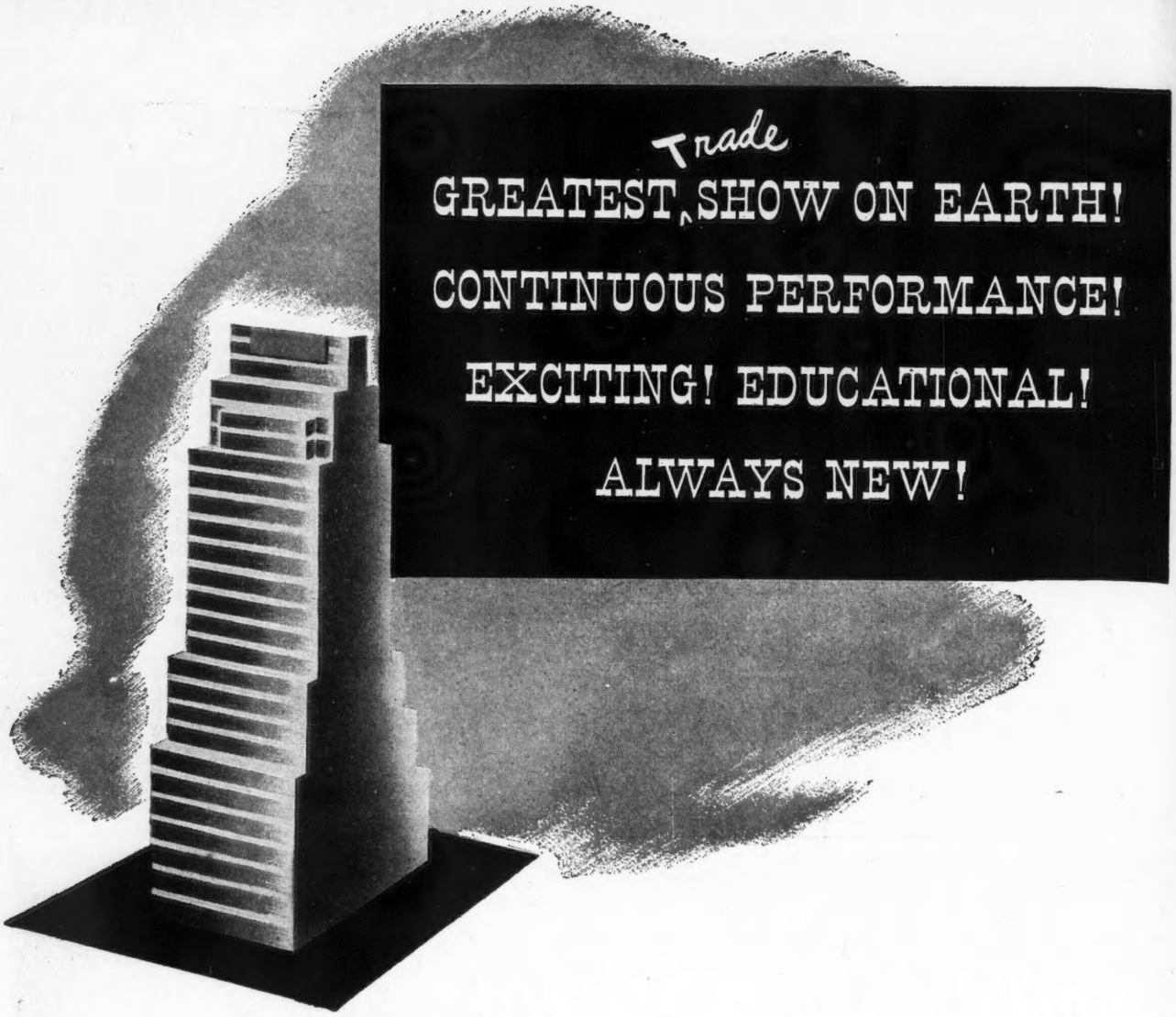

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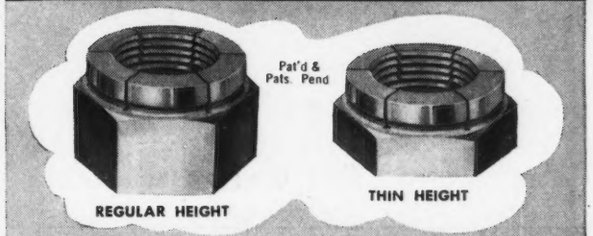

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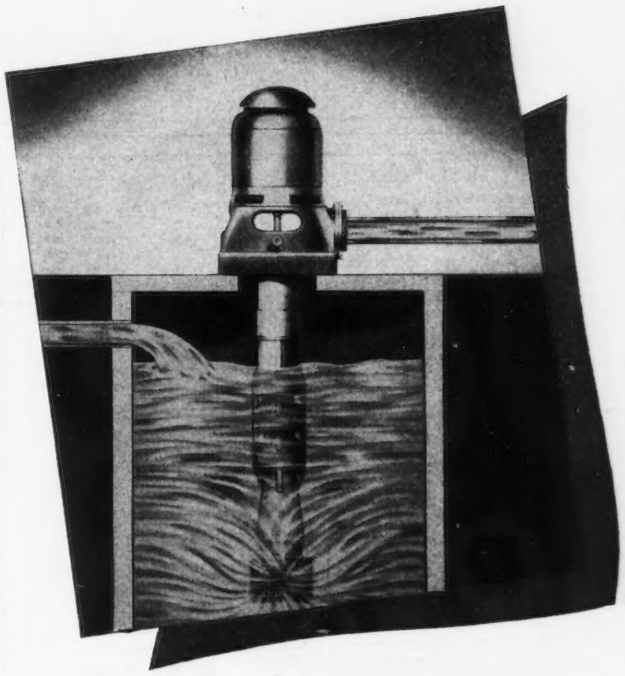

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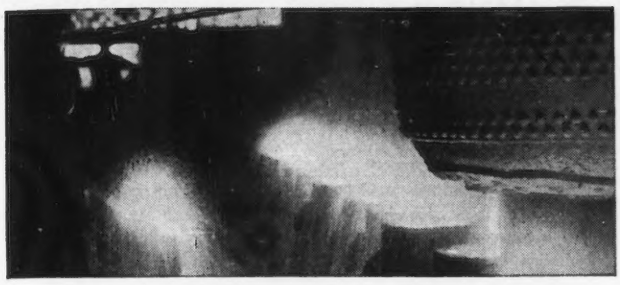

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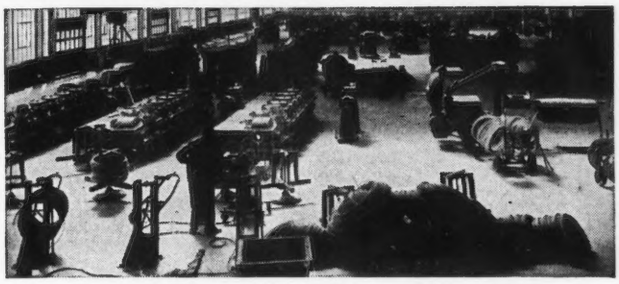

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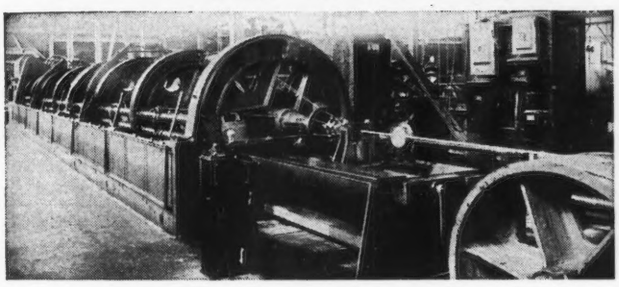

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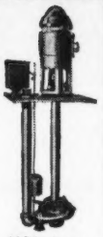
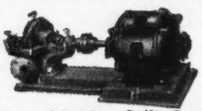
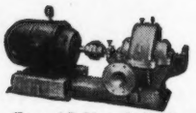


NSA Aurora Centrifugal Sump Pump

Aurora Deep Well Turbines for all conditions—4" to 24"





Type AD Hor. Split Case, Two Stage Centrifugal

Type OD Hor. Split Case Double Suction Single Stage Centrifugal

Type G M C Close-Coupled Centrifugal

Apco Turbine-Type Pumps The simplest of all pumps. Ideal for small capacity, high head duties. Silent, compact and lasting.

The ONLY MOVING PART in the APCO

Type GGU Side Suction Single Stage Centrifugal

APCO Horizontal Condensation Return Unit

APCO Single Stage Turbine-Type

Write for **CONDENSED CATALOG M or See Our Catalog in SWEETS.**

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AURORA Always PUMPS
AURORA PUMP COMPANY
86 Loucks Street, AURORA, ILLINOIS

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HUNDREDS of miscellaneous business problems that confront you from time to time, can be quickly and easily solved through the use of the Searchlight Section of this or other McGraw-Hill publications.

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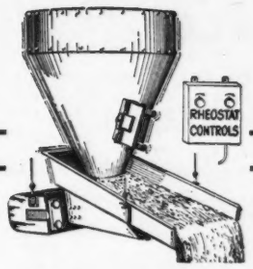
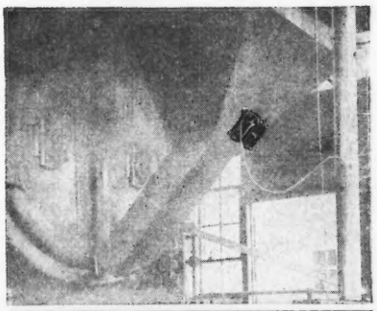
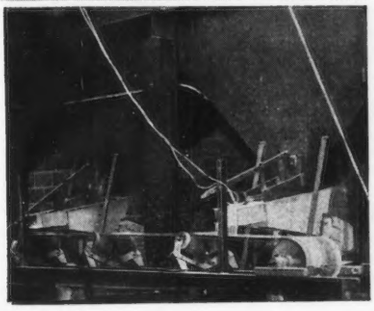
MOVE MATERIAL *the Easy Way— with SYNTRON*







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ELECTRIC VIBRATORS

—to assure free-flowing bins, hoppers and chutes, by breaking down, arching and plugging—without damage to prime equipment.

3600 rheostat-controlled vibrations per minute.

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VIBRATORY FEEDERS

—with their rheostat-controlled flow of practically every kind of material—from stone and ore down to fine powders—hot or cold—dry or moist—at rate of from a few pounds to 500 tons per hour.

Write for illustrated literature

SYNTRON CO.
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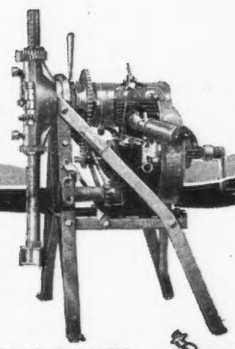
Lightest DIAMOND DRILL OBTAINABLE

MODEL "X-RAY"
★ SURFACE DIAMOND DRILL



Ideal for prospectors and preliminary work. Particularly valuable in remote districts where transportation is a factor. Total weight only 195 lbs. with a capacity of 200 feet; ¾" core.

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Write for Bulletin

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SCENE for *ACCIDENTS* . . .

Rough, broken floors endanger personnel and impede production. For safe, efficient floors, Specify STONHARD RESURFACER . . . Tough and durable, quickly and easily installed.

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Please send us a copy of your maintenance guide and information about STONHARD RESURFACER.

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Experienced in Structural Steel Fabrication of Buildings, Bridges Etc.

Top Pay *Permanent*

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CONSOLIDATED STEEL CORPORATION

PERSONNEL DEPARTMENT

P. O. BOX 6880

East Los Angeles Branch

LOS ANGELES 22, CALIFORNIA

POSITIONS VACANT

WANTED: By large mining company, experienced general accountant for work probably first at El Paso, Texas, later Mexico. Reply by letter with full details, age, experience, etc., to Room 1112 Mills Building, El Paso, Texas.

JUNIOR SHIFT Boss, single preferred, for work in large Copper mine in Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-820, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

JUNIOR ELECTRICAL Engineers, large Copper Company in Chile, South America. Some experience application electrical equipment in industrial plant installations preferred. We require young engineers who are willing to get their training at our Plant and who can advance into various foreman's or engineering positions as they become vacant. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-821, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

ELECTRICIAN, engineering rather than foreman type for work large Copper Company, Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-822, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

FIELD ELECTRICAL Engineer to supervise new installations, direct electrical foremen in maintenance and repair of equipment, etc., large Copper Company, Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-823, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

CIVIL ENGINEERING Graduate, single preferred, to fill position of Roadmaster on Railroad of large copper Company, Chile, South America. Experience on railway maintenance of way preferred. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-824, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

CONSTRUCTION FOREMAN trained in Civil Engineering to carry out engineering and construction details in connection installation new unit generating station large Copper Company, Chile, South America. Should be experienced installation excavation equipment, building forms and placing of reinforcing for concrete work and pouring of concrete. Would probably later be used as Engineering Assistant, Hydraulic Department, therefore, familiarity with hydraulics in general would be asset. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-825, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

WANTED: Large mining company requires services experienced chief storekeeper for operations in South America. Age 35 to 40, knowledge of Spanish essential. Liberal three-year contract, transportation, married quarters. P-819, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

WANTED

MECHANICAL ENGINEER

Mechanical Engineer, 35 to 45 years, married, graduate of accredited school with ten years experience in designing or manufacturing equipment such as Diesel engines, compressors and material handling equipment — crushers, conveyors, feeders and the like. Must be competent to assume responsibility and direct work of Junior Engineers and Draftsmen, prepare cost estimates, evaluate bids and do associated work in connection with mechanical engineering as it applies to material handling in mining operations.

This is an excellent opportunity for a permanent connection with a well established firm. Lake Superior District. Salary commensurate with experience and ability. Write stating age, education and experience.

P-818, Engineering & Mining Journal
520 North Michigan Ave., Chicago 11, Ill.

ASBESTOS MINING ENGINEER

Progressive, long-established corporation has an opening for a Mining Engineer familiar with asbestos mining and manufacturing methods. Excellent opportunity for right man. Send complete resume including education, experience, etc., to P-810, Engineering & Mining Journal
330 West 42nd St., New York 18, N. Y.

POSITIONS VACANT

FIELD ENGINEER to act as assistant to Smelter Engineer large Copper Company, Chile, South America. Position demands thorough knowledge of theoretical and practical mechanical engineering. Require man who can take over position of Smelter Engineer, within 2 or 3 years. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-826, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

MANAGER METALLURGIST: 19 years varied experience. U. S. and Foreign. Desire position outside of U.S.A. Mining, Development, Mill Design, Construction, Operation, Cyanidation, Concentration, and Refining of Gold and Silver Ores. Languages English, Spanish. Available 30 days notice. PW-799, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

GENERAL FOREMAN: Shaft Sinker. Mine Foreman. 30 years experience in tunnel and shaft construction and mine work. Fluent Spanish. Prefer location in warm climate. PW-802, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

GEOLOGIST - ENGINEER, wide experience Western districts, wants direction exploration and development work for company interested in opening new property. Outline of specific requirements copper, lead, zinc, or other metals requested in reply. Available for field work 2 months notice. PW-804, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

ASSISTANT TO Mining Engineer—Part time, as promoter, for new companies, 5 years experience Yukon Placers, familiar with mining procedure, and mining laws in the United States. Chicago only. PW-812, Engineering & Mining Journal, 520 N. Michigan Ave., Chicago 11, Ill.

GEOLOGIST - GEOPHYSICIST desires position in mining or oil, domestic or Latin-American; experienced surveyor, draftsman; fluent Spanish, Portuguese: B.A., Columbia U., graduate study, Cornell U. PW-813, Engineering & Mining Journal, 520 N. Michigan Ave., Chicago 11, Ill.

MINING ENGINEER desires position as Mine superintendent or foreman. Fifteen years experience mining in U. S. Able. Age 38, married. References. PW-814, Engineering & Mining Journal, 68 Post Street, San Francisco 4, Cal.

ELECTRIC ENGINEER available for Company with South American relations. Present Contract as Electric and Construction Superintendent expire soon. Engineering and executive experience, 24 year in Mines desires situation, location immaterial available in short notice. PW-815, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

TEACHER OF Ore Dressing: 37, married, M.S. degree. Experienced as metallurgist and mill superintendent in flotation, cyanidation, gravity including sink-float. Laboratory and mill testing. Assaying. Mill construction. Desires permanent position in a university. PW-816, Engineering & Mining Journal, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

METALLURGIST - MINERALOGIST, age 32, B.S.-M.S. 8 years experience two top flight industrial concerns; laboratory and pilot plant ore dressing research, optical mineralogy, mineragraphy, xray analysis metallic and non-metallic minerals; also experience furnace operation, leaching and filtering; desires position with progressive mining company. Production or production-research work preferred. PW-817, Engineering & Mining Journal, 330 W. 42nd St., New York 18. N. Y.

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COPPER, LEAD, Gold for development. Have your own engineers pass judgement. George Bowman, County Superintendent Schools, Elk Park, N. C.

FOR SALE

I SELL mineral specimens. George Bowman, Elk Park, N. C.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Engineering and Mining Journal, published monthly at Albany, N. Y., for October 1, 1946.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Engineering and Mining Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

1. That the name and address of the publisher, editor, and sales manager is: McGraw-Hill Publishing Company, Inc.; Editor, Evan Just; Managing Editor, A. H. Hubbell; Sales Manager, H. R. Mathias, all of 330 West 42nd Street, New York 18, N. Y.

2. That the owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City. Stockholders holding 1% or more of stock: James H. McGraw; James H. McGraw, Jr.; James H. McGraw, Jr., Curtis W. McGraw and Edwin S. Wilsey, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw and Curtis W. McGraw, all of 330 West 42nd Street, New York City; Edwin S. Wilsey and Curtis W. McGraw, Trustees for James H. McGraw, 3rd, Madison, New Jersey; Curtis W. McGraw, Donald C. McGraw, both of 330 West 42nd Street, New York City; Mildred W. McGraw, Madison, New Jersey; Grace W. Mehren, 536 Arenas St., La Jolla, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

J. A. GERARDI, Secretary.
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 24th day of September, 1946.
[SEAL] ELVA G. MASLIN.
(My commission expires March 30, 1948.)

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2300 Acres undeveloped Placer Mine in Idaho (1390 acres deeded). Average assay 15c. per cu. yd., 400 A. unassayed. 1 to 14 top soil on 60 ft. gold bearing gravel. Est. heavy gold strata on bedrock below gravel. Plenty water, borders Snake River. Suitable for dredging. Known as Bonanza Bar. For information write

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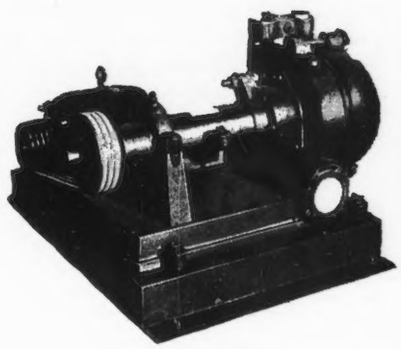
Equipment Wanted Advertising—page 190

Mining and Concentrating Machinery
LARGE STOCK—FULLY RECONDITIONED



SAND PUMPS

1—1″ New Morse Sand Pump.
1—1″ Baker Centrifugal Sand Pump.
1—2″ Kimball-Krogh Centrifugal Sand Pump.
1—3″ Telluride Centrifugal Sand Pump.
1—3″ New Morse Sand Pump.
1—4″ Traylor Centrifugal Sand Pump.
4—Size 5CB New Wilfley Centrifugal Sand Pumps with Motors.
1—6″ Hodge Centrifugal Sand or Slime Pump.
1—7″ American Centrifugal Sand Pump.

GYRATORY CRUSHERS

1—New Sturtevant No. 2, Belt Drive.
1—Allis-Chalmers No. 5, Style N.
1—Kennedy-Van Saun Gearless Primary Crusher, No. 6.
1—Kennedy-Van Saun Gearless Synchronous Motor Driven Fine Reduction Crusher, No. 37.
1—10″ Traylor "Bulldog," Type T.

AIR COMPRESSORS—PORTABLE

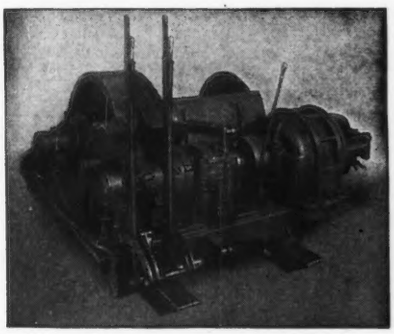
1— 90-CFM Gardner-Rix.
1—120-CFM Schramm.
1—172-CFM Rix.
2—220-CFM Sullivan.
1—220-CFM Chicago-Pneumatic.
1—240-CFM Worthington.
1—310-CFM Ingersoll-Rand.
1—310-CFM Sullivan.
1—320-CFM National.
1—330-CFM National.

TROLLEY LOCOMOTIVES

1—3½-Ton Baldwin, Gauge 21″.
1—4-Ton Jeffrey, Type DM, Gauge 24″.
1—4½-Ton General Electric, Gauge 24″.
2—6½-Ton General Electric, Gauge 36″.
1—7-Ton General Electric, Gauge 40″.
1—10-Ton General Electric, Gauge 40″.

LATHES

1—15″x8′ South Bend Quick Change Lathe, Back Geared.
1—20″x7′ Putnam Machine Company Engine Geared Lathe.
1—20″x12′ Wolcott Quick Change Engine Lathe.
1—20″x20′ Rahn & Carpenter Lathe.
1—26″x11′6″ Gisholt Heavy Duty Combination Turret Lathe.
1—36″x22′ Davis & Egan Engine Lathe, Change Gear Type.
1—38″x12′ Engine Lathe, Belt Drive, Light Service.
1—No. 2 Warner & Swasey Collet Turret Lathe.
1—No. 25 LeBlond Heavy Duty Geared Head Lathe.
1—Gisholt Turret Lathe, 24″ Universal Chuck.

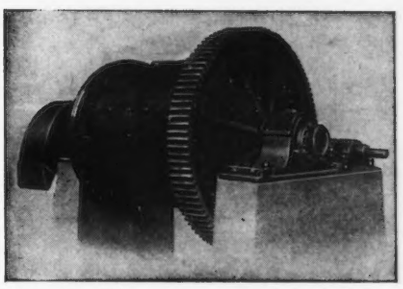


ELECTRIC HOISTS

1—5-HP Single Drum—Band Brakes.
1—10-HP Single Drum—Friction.
1—15-HP Single Drum—New Morse Bros.
1—20-HP Single Drum—Vulcan.
1—20-HP Single Drum—H&B.
1—22-HP Double Drum—Vulcan #1½.
2—30/40-HP Single Drum—Vulcan #22-C.
1—37-HP Single Drum—Steel Frame.
3—52-HP Single Drum—Vulcan #4½.
1—60-HP Single Drum—Vulcan.
1—100-HP Single Drum—H&B.
1—150-HP Single Drum—Ottumwa.
1—150-HP Single Drum.
1—200-HP Single Drum.
1—300-HP Double Drum—Ottumwa.

BALL MILLS

1—3′x3′ Morse Ball Mill.
1—3′x9′ Ruth Rod Mill, Open End.
1—4′x4′ Morse Ball Mill.
1—4′x11′ Ruth Rod Mill, Open End.
1—4′6″x13′ El Paso Tube Mill.
1—5′x22″ Hardinge Conical Ball Mill.



1—5′x7′2″ Ball-Tube Mill, Batch Type.
2—5′x12′ New Marcy Open End Rod Mills.
2—8′x22″ Hardinge, Type A, Conical Pebble Mill.

STEAM DRIVEN GENERATORS

4—¾-KW Pyle National Steam Turbine DC Generators.
1—¾-KW American Headlight Turbine DC Generator.
1—1½-KW Moon Turbine DC Generator.
1—2-KW Pyle National DC Turbo-Generator.
1—5-KW Westinghouse DC Turbine .Generator.
1—7½-KW Northern Electric DC Generator.
1—35-KW Sprague DC Generator. Driven by De Laval Steam Turbine.

DIESEL GENERATORS

1—35-KW Caterpillar Diesel-Electric Set with #46-30 Caterpillar 6 Cylinder Diesel and 440 Volt Generator with Exciter and Switchboard.
1—25-KW Caterpillar Diesel-Electric Set with #44-20S Caterpillar 4 Cylinder Diesel and 440 Volt Generator with Exciter and Switchboard.
2—15-KW Century Generators powered by 35 HP, 4 Cylinder Waukesha Diesel Engines.

MISCELLANEOUS EQUIPMENT

1—Type E Ainsworth, No. 705, Assay Balance.
300—Type 250-EL American Industrial Fans.
1—8′ x 26′5″ Dorr Duplex Rake Classifier.
1—A. B. Farquhar Coal Unloader Conveyor.
1—Model 6-M, W-W Hammer Type Feed Grinder.
50—½-HP Master Gearhead Motors, Type RA, 1-ph., 60-cy., 115/230-volts, 48-rpm.
1—6″ Forbes Pipe Threading Machine, Size 1½″ x 6″.
1—5¼″ x 3½″ x 5″ Worthington Duplex Steam Pump.
6—300 Amp. General Electric Arc Welders. Driven by 3-ph., 60-cy., 440-volt, 1750-rpm. motor.
45—2-Ton New Navy Hand Winches, Triple Geared.

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BRANCH OFFICE 1775 BROADWAY, NEW YORK CITY

Rebuilt Mining & Milling Equipment

LABORATORY EQUIPMENT
1—7″ x 14″ Denver Rod Mill—Motorized
1—10 x 6 McFarlane Crushing Roll
1—Laboratory Wilfley Table
1—1000 Gram Denver Flot
1—500 Gram Weinig Flot
1—12″ x 12″ Lab. oven, 110 volts

MOTORS—NEW
3—1 H.P. Louis Allis, 1150 RPM
3—1½″ H.P. Louis Allis, 1140 RPM
2—2 H.P. Louis Allis, 1140 RPM

MOTORS—USED
1—50 H.P. G. E. Slip-ring, 1725 RPM
3—1½ H.P. G. E., 1200 RPM
1—2 H.P. Allis-Chalmers, 1740 RPM
1—3 H.P. Wagner, 860 RPM
1—5 H.P. G. E., 1200 RPM
1—5 H.P. West. Elec., 1800 RPM
2—5 H.P. West., 1120 RPM
1—15 H.P. West., 850 RPM

FLOTATION MACHINES
2—6 Cell #18 Denver Equip., Wood Tanks
2—6 Cell #21 Denver Equip., Steel Tanks

PUMPS—SAND
2—1″ Wilfleys—Motorized
7—2″ Wilfleys—Motorized
2—3″ Wilfleys—Motorized
1—3″ Wilfleys—B.D.
1—2″ Kimball-Krough—Motorized

JIGS
1—8 x 12 Denver Duplex
2—18″ x 36″, 4 Compt. Hartz (new)

THICKENERS
1—26′ x 10′ Denver
2—20′ x 8′ Dorr Type
1—20′ x 10′ Hirsch (steel tank)

BALL MILLS
1—6′ x 7′ with 125 H.P. Syn. Motor
1—5′ x 4′ C.I.W. with 50 H.P. Slip-Ring Motor
1—4′ x 10′ Tube or Pebble Mill

FILTERS
1—5′4″ x 4′ Oliver
1—4′ x 6′ Oliver
1—6′ x 6′ Dorrco

CRUSHERS
1—20 x 10 Allis-Chalmers
1—15 x 9 Fraser & Chalmers Blake

CONCENTRATING TABLES
1—Plat-O-Motorized
2—Butcharts—Motorized
5—Wilfleys—Motorized

CLASSIFIERS
1—6′ x 21′4″ Dorr Duplex
1—27″ x 14′ Denver Simplex
1—36″ x 15′ Wemco Spiral
1—15″ Akins High Weir

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30″	5	1/8″	1/16″
24″	5	1/8″	1/32″
24″	4	1/8″	1/32″
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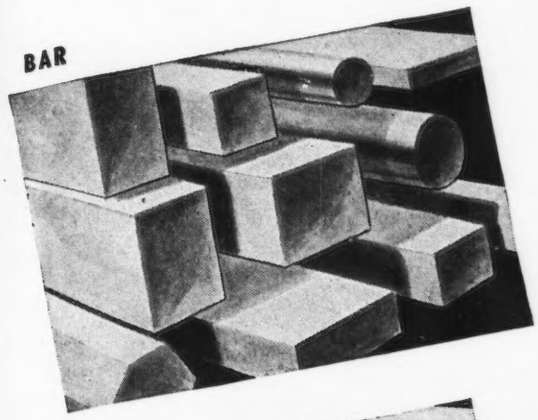

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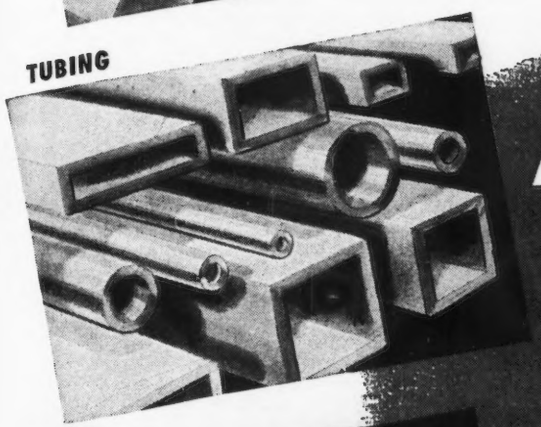

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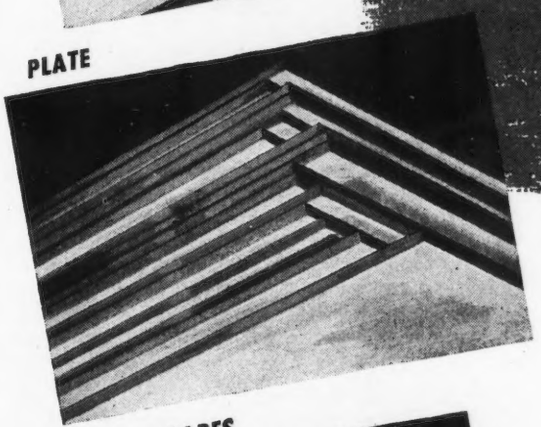

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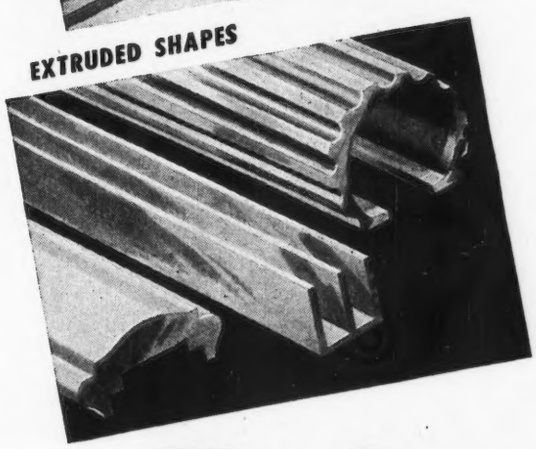

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137-9

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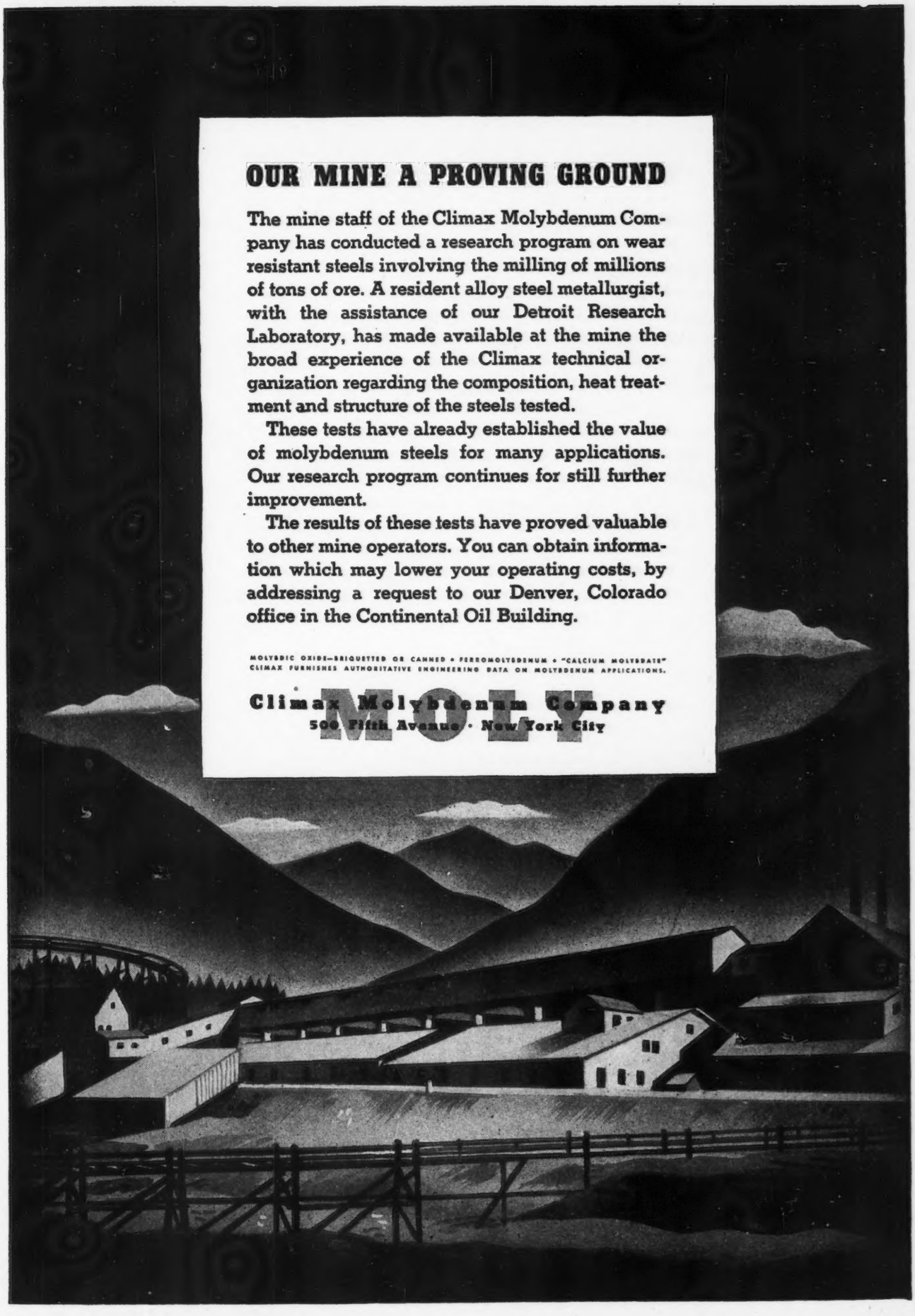

OUR MINE A PROVING GROUND

The mine staff of the Climax Molybdenum Company has conducted a research program on wear resistant steels involving the milling of millions of tons of ore. A resident alloy steel metallurgist, with the assistance of our Detroit Research Laboratory, has made available at the mine the broad experience of the Climax technical organization regarding the composition, heat treatment and structure of the steels tested.

These tests have already established the value of molybdenum steels for many applications. Our research program continues for still further improvement.

The results of these tests have proved valuable to other mine operators. You can obtain information which may lower your operating costs, by addressing a request to our Denver, Colorado office in the Continental Oil Building.

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CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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MOLY

They dig a lake to float a boat that never sails

A typical example of B. F. Goodrich development in rubber

UNDER that placid lake is a gold mine busily at work. At the spot picked by experts, miners dig a lake and build a dredge on it. Then gravel is scooped up from the lake bottom, the gold separated, and the worthless gravel dumped out of the way.

The toughest job is to get rid of the gravel. Conveyor belts were tried but the gravel is so wet it slipped *down* faster than the moving belt could carry it *up* and away.

Before the war B. F. Goodrich engineers began work on some method of solving the problem. They built a trough of boards, inclined as the belt is, in use, and poured whitewash into it, studying the travel of the whitewash down the slope.

Gradually they developed a pattern of belt surface — a series of ridges — which held the gravel but let the water run off to the sides.

A belt was built with this surface pattern, tried, and worked perfectly. The grooves last the full life of the belt. This new B. F. Goodrich "Riffle Top" belt, as it has been named, is now at work in gold mines and other work where wet, slippery material must be carried up steep grades. It will make many mining and construction jobs cheaper, more efficient—typical results of B. F. Goodrich research and the reason it pays to find out what improvements B. F. Goodrich has made since the war in any rubber product you use. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

RUBBER *and* SYNTHETIC *products*

THE ACCO-LOC SAFETY SPLICE

MAKES ENGINEERS SAY:

"GEE! WHY DIDN'T I THINK OF THAT?"

A SAFER, MORE RELIABLE METHOD FOR MAKING WIRE ROPE ENDINGS.....

.....This vastly improved method makes the old, hand-tuck splicing obsolete and unnecessary. The ACCO-LOC Safety Splice is neat, compact, flexible to the terminal. It always develops 100% rope strength. Can be used with any standard fitting. Send for literature.

The utter simplicity of the ACCO–LOC Safety Splice appeals to every engineer. ACCO–LOC Safety Splice offers many advantages. In the first place, it does not distort the rope structure as does hand–tuck splicing. Next, ACCO–LOC Safety Splice is safe. No wire ends to barb; no seizing wires to loosen. Then — it is extremely flexible — clear to the terminal. This permits of close snubbing. Of course, it can be used with any standard fitting (hook, shackle, ring, thimble, etc.) — while the wire rope is TRU–LAY Preformed—the safe, kink–resisting—easy–to–handle, long–wearing rope.

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Keep your miners smiling with TIMKEN BEARING equipped cars

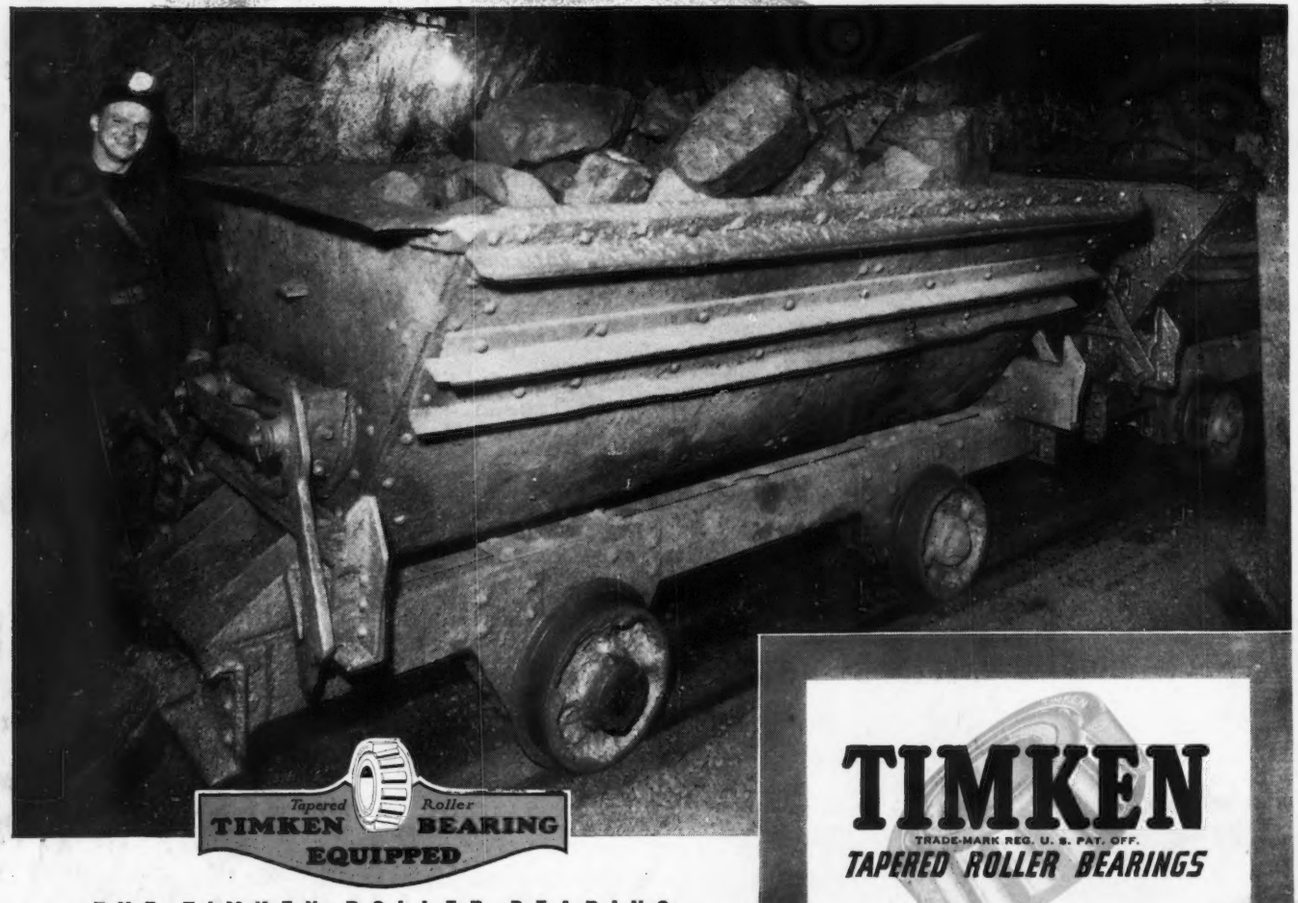
Mining is a tough job at best, but it pays to make it as easy as possible — as hundreds of mine operators can testify.

Miners prefer mine cars equipped with Timken Tapered Roller Bearings because they are easier to handle and enable the men to get out more tonnage per shift.

For this reason and because Timken Bearing Equipped mine cars have greater availability for service and require minimum attention for lubrication and maintenance, mine operators find them a source of increased profit.

The cars shown in the photograph are 76 cubic feet double rocker dump tram cars built by Lake Shore Engineering Company, Iron Mountain, Michigan.

Lake Shore has used Timken Roller Bearings for many years; is strong for them because they make *better cars* and *better selling cars.* Look for the trade-mark "TIMKEN" on every bearing that goes in your equipment.



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